Solar Millennium LLC

Updated Plan of Development

AMARGOSA – FARM ROAD SOLAR PROJECT
BLM Land Use Application, File # NVN- 84359

Revised Submission 11/26/08

Bureau of Land Management
Pahrump Field Office
Bureau of Land Management
4701 North Torrey Pines Dr.
Las Vegas, NV 89130

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Acronyms used in this document:

MW	Megawatts
VE	Valley Electric
NPC	Nevada Power Company
GSP	Gross State Product
GWh	Gigawatt-hours
ROW	Right of Way
SPP	Sierra Pacific Power Company
DNI	Direct Normal Insolation
NREL	National Renewable Energy Laboratory
HTF	Heat Transfer Fluid
kV	kilovolts
NPDES	National Pollutant Discharge Elimination System
Gpm	Gallons per minute
Acf	Acre-feet
FM	Fire Marshall
NFPA	National Fire Protection Association
HDPE	High density polyethylene
STG	Steam Turbine Generator
CAS	Chemical Abstracts Service
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
HCE	Heat Collection Element
SCA	Solar Collector Assembly
HV	High Voltage

Project Description

a. Introduction

This updated Plan of Development is being submitted to the U.S. Bureau of Land Management (BLM) Tonopah Field Office in connection with NVN # 84359, a right of way (ROW) application for the design and development of two commercial solar parabolic trough generating stations, with a combined generation output rating totaling approximately 500 MW, per guidance from the BLM's solar energy development policy, Instruction Memorandum No. 2007-097 (IM 2007-097).

Planning, permitting, contracting and implementation of large power projects is a complex process that, when conducted prudently and optimally, is carried out over many years. Solar Millennium selected this BLM site due to its excellent solar radiation, access to existing electric transmission corridors, and access to skilled labor and other industrial infrastructure in nearby Las Vegas. Solar Millennium is prepared to undertake long-term stewardship of the project site to meet the near term clean energy requirements of the state while recognizing the environmental sensitivity of the land.

Solar Millennium has built a strong team that is technically as well as financially competent to carry out this development. Solar Millennium is currently involved in the development and construction of the Andasol three-unit solar power park in southern Spain, and is developing another 800 MW of Spanish projects that are already fully permitted.

i. Type of facility, planned uses, generation output

The proposed facilities consist of two 242 MW solar power plants equipped with thermal energy storage capability. The proposed plants would occupy approximately 4,000 acres of land and would include two solar fields consisting of parabolic trough mirrors, each with a central power block housing a steam turbine, cooling equipment, and thermal energy storage tanks. The generating stations would share common facilities such as an office, maintenance building, roads, 230 kV substation and transmission line, and a storm water pond. If evaporative cooling is utilized, the facilities would include evaporative water ponds, and a water pipeline would be used to transport water to the site.

With thermal energy storage capability, the plants will be able to generate energy for several hours after sundown. This capability is unique to solar thermal technology.
The proposed facilities will produce clean, renewable energy sufficient for the consumption of approximately 150,000 Nevada households[1]. The proposed facilities will be ready to meet Nevada's renewable energy needs as the state faces increased pressures from global climate change.

Figure 1: Parabolic Trough Technology

ii. Schedule for project - anticipated timelines for permitting, construction and operation, and phased development

The proposed plan calls for a one to three year permitting period with a plan to build two 242 MW parabolic trough plants, incorporating thermal storage, on sections of BLM land on BLM land in the Amargosa Valley beginning in 2010-2011. The final size of the plants and schedule for construction and commissioning will depend on development studies as well as the pace of transmission upgrades currently being planned by Valley Electric (VE) and Nevada Power Company (NPC).

[1] Assuming 2006 annual energy consumption of 977 kWh per month, per household. Source: Energy Information Administration

	2009	2010	2011	2012	2013	2014	2015
Plant I							
Permitting (NEPA)							
Construction							
Operation							
Plant II							
Permitting (NEPA)							
Construction							
Operation							

Figure 2: Project Development Schedule

b. Proponent's purpose and need for the facility

Concentration of clean solar power capacity on federal lands responds to Nevada's rapidly growing needs for reliable, clean peaking power as well as to the need to minimize environmental impacts by concentrating solar power generation in "development corridors" located near existing roads and transmission lines, thus reducing the scattered utilization of sensitive desert habitat.

Nevada utilities will need in excess of 3,000 GWh/yr of new renewable energy generation capability over the next 10 years to meet the state's clean energy needs. Nevada's renewable portfolio standard law requires the state's utilities to procure 20% of their energy from renewable sources by 2015. The state Renewable Energy and Conservation Task Force has estimated by increasing in-state renewable energy production to just 15% of the state's generation, over 5,000 new jobs could created, with an average annual GSP effect of $665 million through 2035. It is expected that at least 700 MW of new solar power will be required to meet this need, and that this amount could grow to over 1,000 MW.

The concentrating solar plants proposed at this BLM site will be critical to meeting these important mid- and long-term needs.

Solar Millennium requests that BLM approve this Plan of Development so that the proposed Projects can be constructed and assist Nevada utilities to meet their legal obligation to purchase renewable energy.

Figure 3: Project site. East of T&T road, looking north

c. General facility description, design and operation

i. Project Location, Land Ownership and Jurisdiction

The project site area, as shown in Figures 3 and 4, is located in Nye County, 80 miles northwest of Las Vegas and 360 miles southeast of Reno, west of Highway 373, on BLM administered land subject to this ROW Application. The site was carefully chosen by Solar Millennium based on the following criteria:

Proximity to Nevada Power Transmission Network: The project site is located near the Valley Electric Valley Substation. A short gen-tie line will be constructed by Solar

Millennium from the plant site to the Valley Substation. The Valley Electric line connects to the Nevada Power Transmission system at Pahrump substation.

Excellent Solar Resource: The high elevation, in the Greater Mojave Desert, is a unique region with some of the world's best direct normal insolation (concentrating solar power can capture only the direct normal or "beam" solar radiation). Direct Normal Insolation (DNI) levels in this region are approximately 7.5 kWh/m2/day.

Proximity to support communities: This project site is located in Amargosa Valley and 30 miles from Pahrump. Solar Millennium has had multiple high level meetings with community leaders in Nye County. This project has been well received by the community to date.

Plant electrical output will be delivered to Valley Electric and wheeled to Nevada Power.

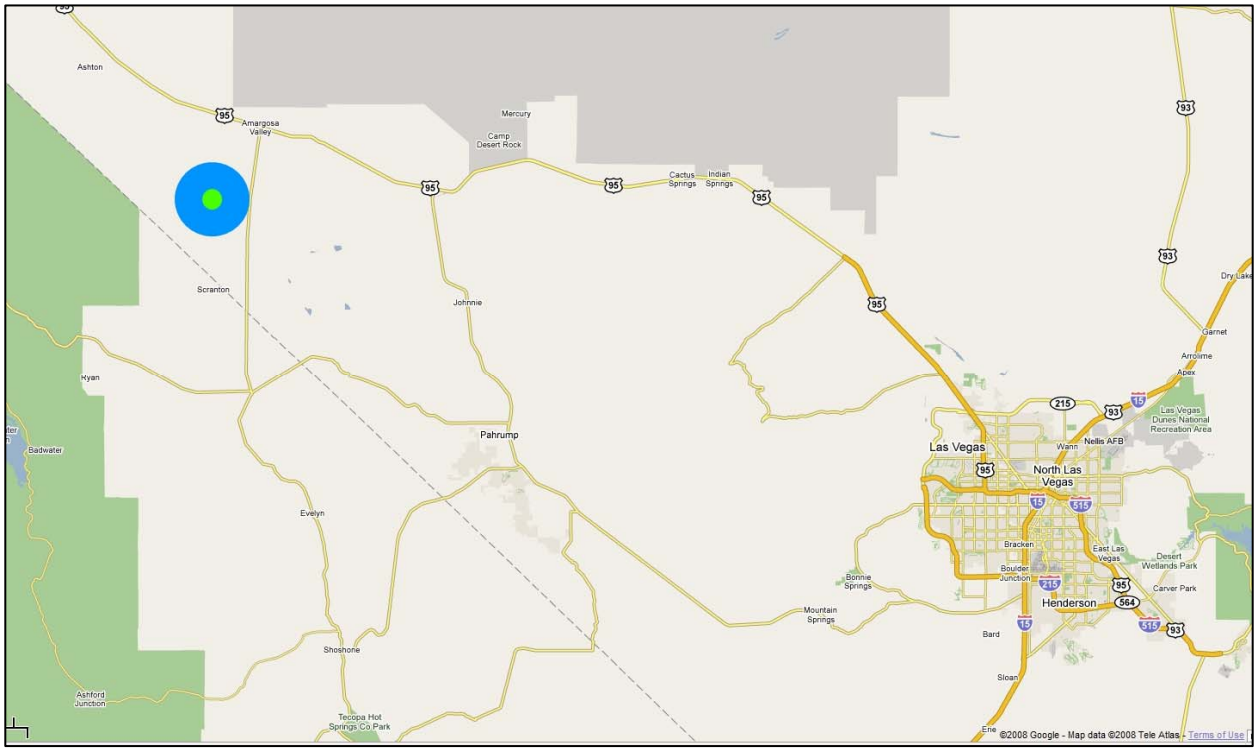


Figure 4: Map showing Project site location

The plant will be located on public land within Bureau of Land Management (BLM) right-of-way (ROW) application # NVN – 84359. The land covered by this ROW is shown in Figure 5 below. Other linear ROWs are expected to be a part of, or needed in conjunction with, this Project (e.g. water pipeline, transmission line). However, a

decision regarding evaporative or dry cooling has not been made at this time; and therefore the possible route of a potential future water pipeline has not been selected. Furthermore, transmission studies have not been completed, and thus a future transmission line route has not yet been determined. As soon as any definitive plans for water supply and transmission line routing are in place, the appropriate SF 299 applications will be filed.

ii. Legal land description of facility (federal and non federal lands)

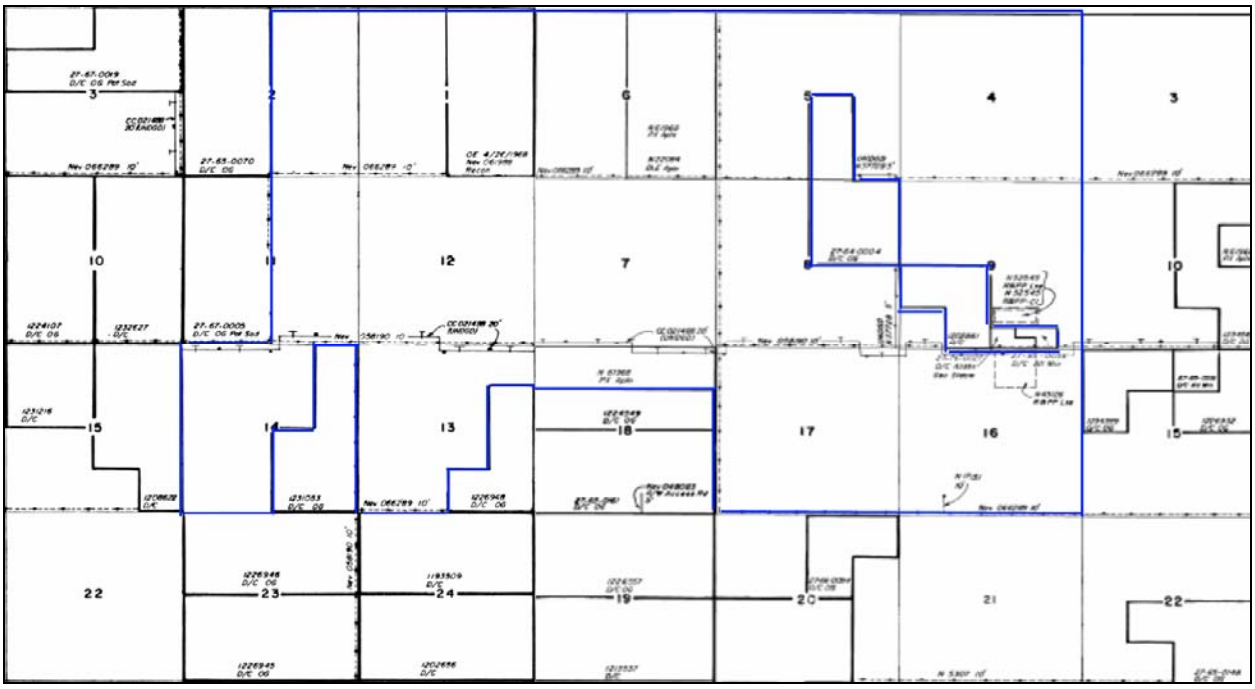


Figure 5: BLM Master Title Plat Map of Right-of-Way of Right-of-Way # NVN 84359

The legal description of the area covered by ROW # NVN – 84359 is as follows:

State of Nevada, Nye County, Mount Diablo Base & Meridian

T. 16 S., R. 48 E.,
sec. 1 - all;
sec. 2 - E2;
sec. 11 - E2;
sec. 12 - all;

sec. 13 - W2, NWSE, SWNE ,N2NE;
sec. 14 - W2, W2NE;

T. 16 S., R. 49 E.,
sec. 4 - all;
sec. 5 - W2, NE, E2SE;
sec. 6 - all;
sec. 7 - all;
sec. 8 - W2, SE;
sec. 9 - N2, SWSW, N2SE, N2SESE, SESESE;
sec. 16 - all;
sec. 17 - all;
sec. 18 - N2NW, N2NE

The entire project area consists of Federal lands. Private lands lie within the site area but are not contemplated for inclusion in the projects. A list of the existing ROWs shown on the Master Plat Map is attached as Exhibit 1; the ROWs shown are mining ROWs that Solar Millennium understands are no longer in force, and expects will be removed by the BLM.

iii. Total acreage and general dimensions of facilities and components

The total ROW acreage is 7,810 acres. Within the ROW area, the solar fields, the power blocks, buildings, the parking area, the laydown area, the stormwater retention pond, evaporating ponds (if wet cooling is used) and the substation will occupy approximately 4,350 acres. Once project design is final, at the end of the permitting process, any parcels of land not needed for project construction or operation will be ceded back to the BLM.

iv. Power plant facilities, thermal conversion process

Parabolic trough solar power technology is the only solar thermal power technology that has a proven performance and commercial record on a large scale. Nine plants with a total capacity of 354 MW, built in the Mojave Desert in the 1980's and early 1990's, are all still running today. The solar field performance at the Kramer Junction site, as a case in point, has consistently exceeded design values during the important peak power demand period. Since 2004, this technology has experienced a strong revival, especially in the Spanish power market.

Solar Millennium, through its engineering subsidiary Flagsol GmbH, is involved in various execution steps of three large parabolic trough plants in Spain (the AndaSol 1, 2 and 3 projects). Flagsol is currently supervising completion of solar field installation and initial collector check-out testing at AndaSol 1, which is anticipated to be completed later this year. We are supporting procurement and construction for the AndaSol 2 project, which will become operational next year. Flagsol is leading the final design of the AndaSol 3 project, and will be part of the EPC execution team for that plant.

Each of the two units consists of a 242 MW net reheat steam cycle power block, a parabolic trough solar field, a heat transfer fluid and steam generation system, a nitrate salt thermal energy storage system, and a "balance-of-plant" with electrical switchgear and maintenance facilities. Should wet cooling be employed, the plant design will also include water tanks and pools, and a water pipeline. A general plant schematic is shown in Figure 5 below.

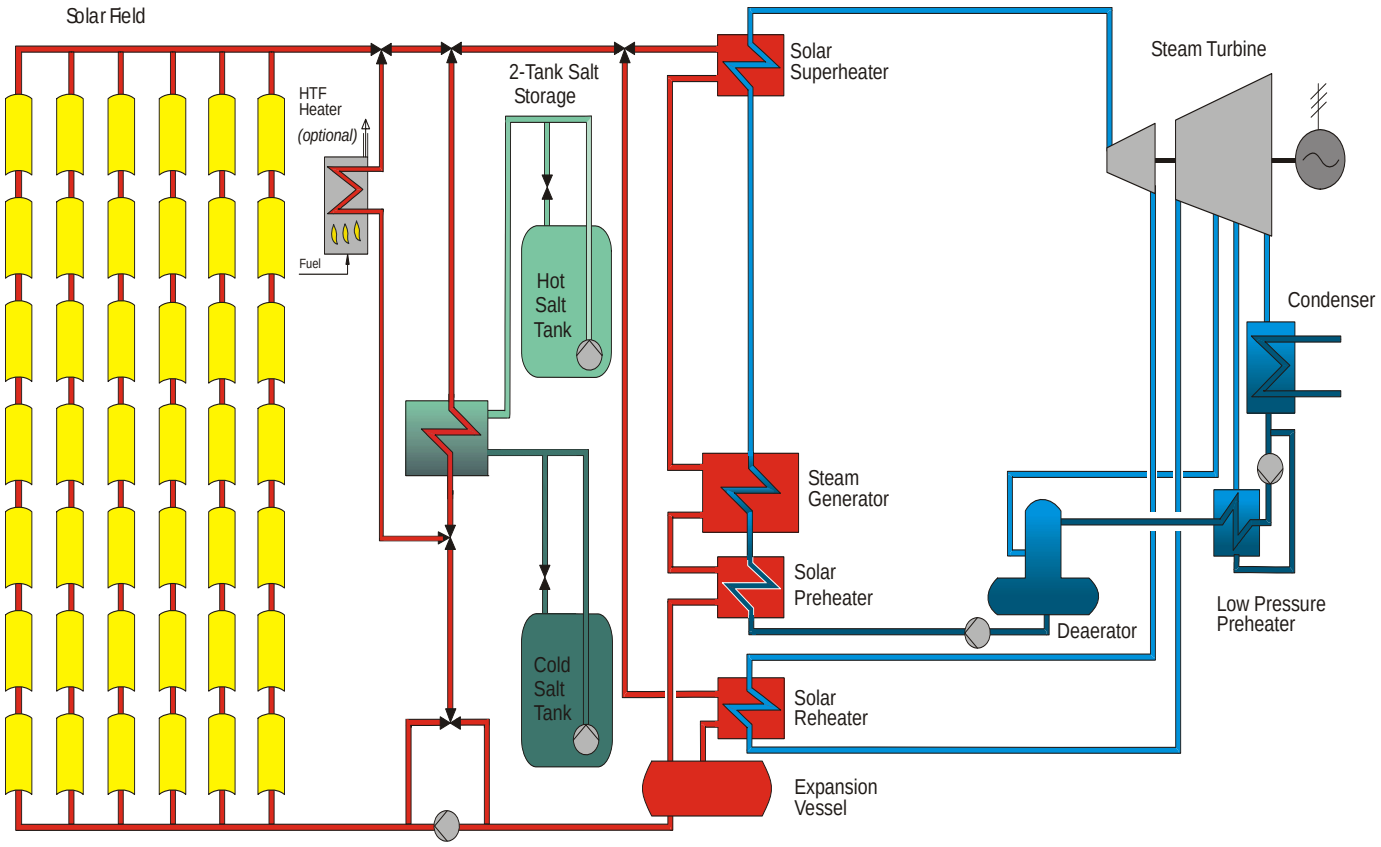


Figure 6: Plant Schematic Diagram (with Thermal Storage)

The power blocks, including the steam cycle, HTF system, thermal storage system, and wet cooling system, if utilized, are located at the center of each solar field. Several buildings related to process control are located within the power blocks. The collector has a linear parabolic-shaped reflector that focuses the sun's direct beam radiation on a receiver tube located at the base of the parabola. The receiver tube is comprised of a stainless steel with a highly absorptive, low emissivity coating which is encased in an outer glass tube evacuated to reduce thermal losses.

The collectors track the sun from east to west during the day to keep the sun's rays continuously focused on the receiver tube. The row of collectors has a hydraulic drive unit with sensors to determine appropriate collector orientation throughout the day and according to ambient conditions. The drive unit also reports operational status, alarms and diagnostics to the main solar field control room.

Solar Millennium's collectors have been thoroughly tested for 4 years in a demonstration loop located at FPL Energy's operational SEGS V solar trough plant at Kramer Junction, California. Performance testing by the National Renewable Energy Laboratory (NREL) has shown excellent optical efficiency of the collector. This collector was developed over several years with partial support from the EU and the German government, and with periodic input from and discussions with site operators at Kramer Junction.

A heat transfer fluid (HTF) is heated to a high temperature as it circulates through the receiver tube and returns to a series of heat exchangers in the power block where the fluid is used to generate high-pressure superheated steam. The superheated steam is then fed to a conventional power block, consisting of a reheat steam turbine generator to produce electricity, and carried to a nearby substation via a project-specific transmission line. Condensing steam Rankine cycle turbines with single reheat and six extractions have been in commercial operation for many years, and are available from numerous world-class suppliers.

The spent steam (water) from the turbine is condensed and returned back to the heat exchangers via condensate and feedwater pumps to be transformed back into steam. The cooling required for a solar thermal plant is nominally the same as that required for a fossil fueled power plant that produces the same amount of power. After passing through the HTF side of the solar heat exchangers, the cooled HTF is re-circulated through the solar field.

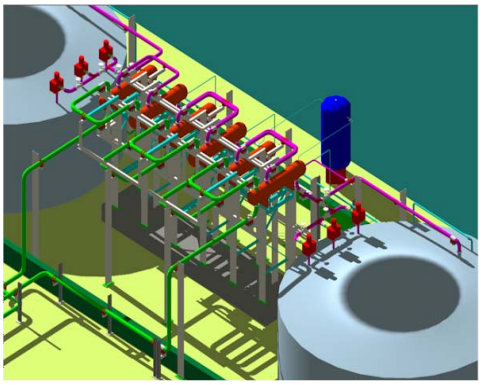


Figure 7: Thermal Storage Tanks

Each plant includes thermal storage, consisting of a dual, two-tank molten salt system, sufficient to support approximately 3.5 full load hours of electricity production. The thermal energy storage (TES) system contains a ""hot" and a "cold" storage tank connected via two parallel trains of six oil-to-salt heat exchangers in series. For charging the storage, the salt is heated up to approximately 386°C, and for discharging it is cooled down again to approximately 292°C.

The salt freezes at approximately 221°C. Freezing of the salt must be avoided to prevent damage of components. The freeze protection system, which uses the hot HTF, keeps the salt at a minimum temperature of 260°C. To avoid freezing of the salt in non-working periods, the heat exchangers are equipped with electrical heat tracing.

The electric output of the plant will be supplied entirely with solar energy. No electricity is generated by the use of fossil fuel in this plant complex. A small gas-fired heat transfer fluid (HTF) heater is used for infrequent freeze protection of the HTF in the solar field. Gas for this purpose is supplied by truck.

The HTF is a synthetic hydrocarbon liquid – diphenyl/biphenyl oxide – that has a freezing point of about 55ºF. Freeze protection is routinely accomplished by circulating HTF at a very low flow rate through the solar field using hot HTF from the storage tank as a source. Performance model results indicate that the HTF heater may be required on very cold nights in the deep winter months.

Approximately 90% of the plant footprint is taken by the parabolic trough solar field. The solar field is highly modular and consists of "loops", consisting of 4 collectors. A loop is 22m wide and 850m long, and is designed to raise the temperature of the heat collection fluid by approximately 175 ^{o}F. A solar field consists of 200 to 400 loops. The orientation of the collectors is north – south.

A temporary construction laydown area, the substation, the office and parking area, and the temporary assembly buildings are located adjacent to the solar fields. The assembly buildings will be converted to a maintenance and spare parts facility once the plant is in operation. If evaporative cooling is utilized, evaporation and stormwater ponds will also be located adjacent to the solar fields. There are maintenance access roads around the solar fields, between solar field loops, and to the power blocks.

The facilities will include a bioremediation unit to treat soil contaminated with HTF. The unit will be designed in accordance with BLM, county and federal requirements. The bioremediation area will cover approximately 400 feet by 800 feet.

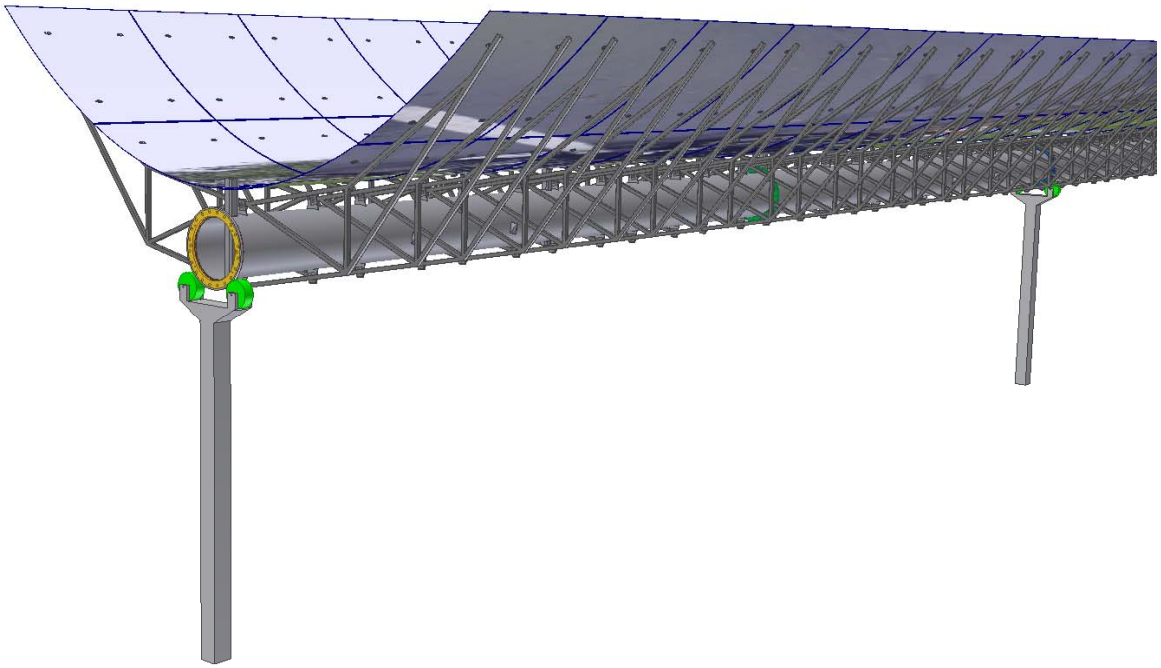
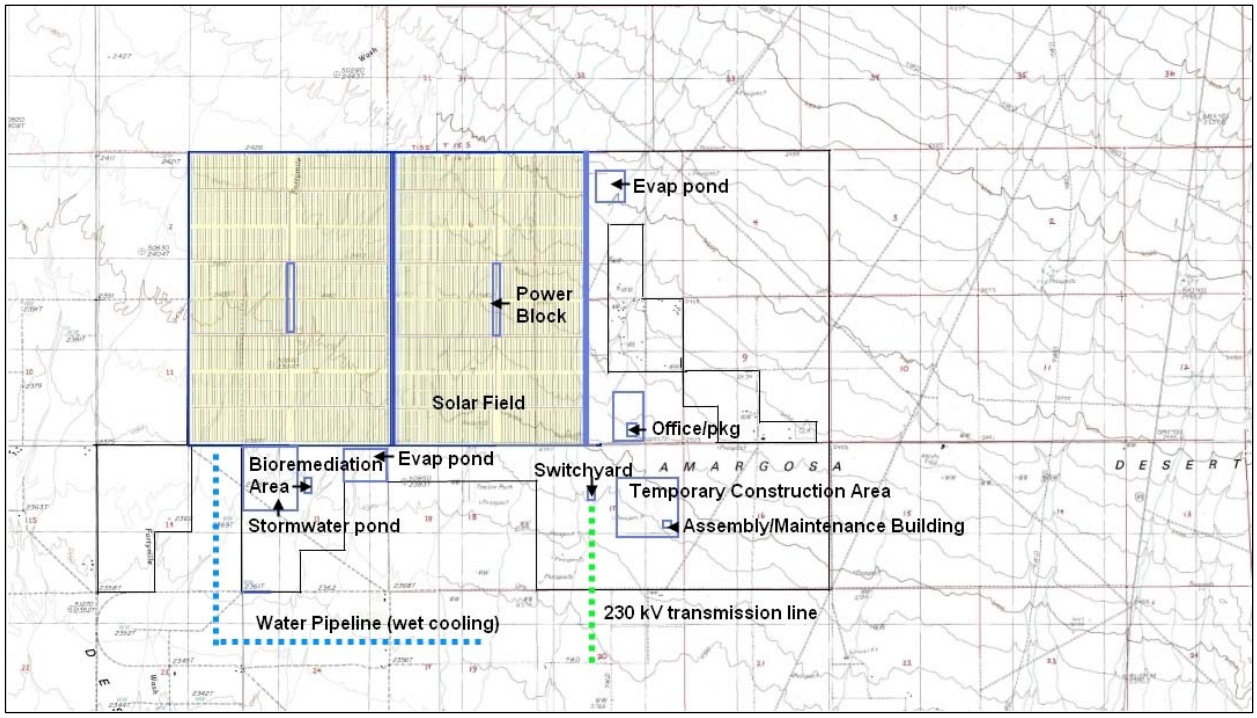


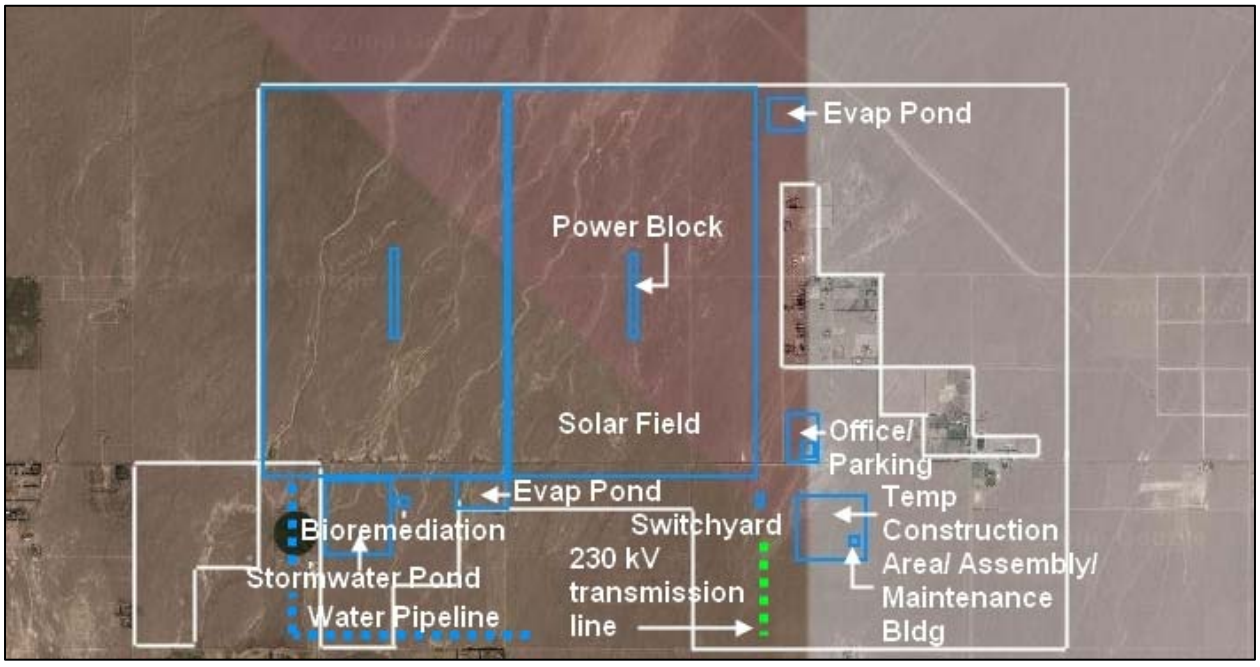
Figure 8: A parabolic trough

v. Numbers and general dimensions of solar array, power generation units (wet or dry cooling), towers, substations, transmission lines, access roads, buildings, parking areas

The preliminary site layout within the ROW area is shown in the following Figure 9.

Figure 9: Preliminary Site Layout





General facility dimensions:

Solar fields:	Two fields, each 1,877 acres
Power blocks:	Located in center of solar field, approx. 1,320’ by 300’, height 61’ (9 acres)
Thermal storage tanks:	Located in power block
Parking area:	Approx 250’ x 100’ (.5 acres)
Office:	Approx. 100’ by 30’ by 12’ (.06 acres)
Temporary laydown area (for construction):	Approx. 2,000’ x 3,000’ (140 acres)
Assembly hall/ maintenance building:	Approx. 330’ x 130’ height 35’ (2 acres))
Substation/switchyard:	Approx. 100’ x 100’ (.22 acres)
Evaporating ponds (wet cooling option):	Two, ea. 1,000’ x 500’ (24 acres)
Storm water pond:	1500’ x 1500’ (70 acres)
230 kV transmission line:	Acreage and location subject to results of transmission study
Water pipeline:	Acreage and location dependent on selection of wet or dry cooling
Site access:	Via Farm Road; internal road locations subject to detailed engineering
Bioremediation area:	400’ x 800’ (7 acres)

Total disturbed acreage: 4,000 acres
ROW acreage: 7,810 acres

The proposed site layout will require the rerouting of Amargosa Farm Road, and the power line that parallels Farm Road, to follow the southern perimeter of the solar fields.

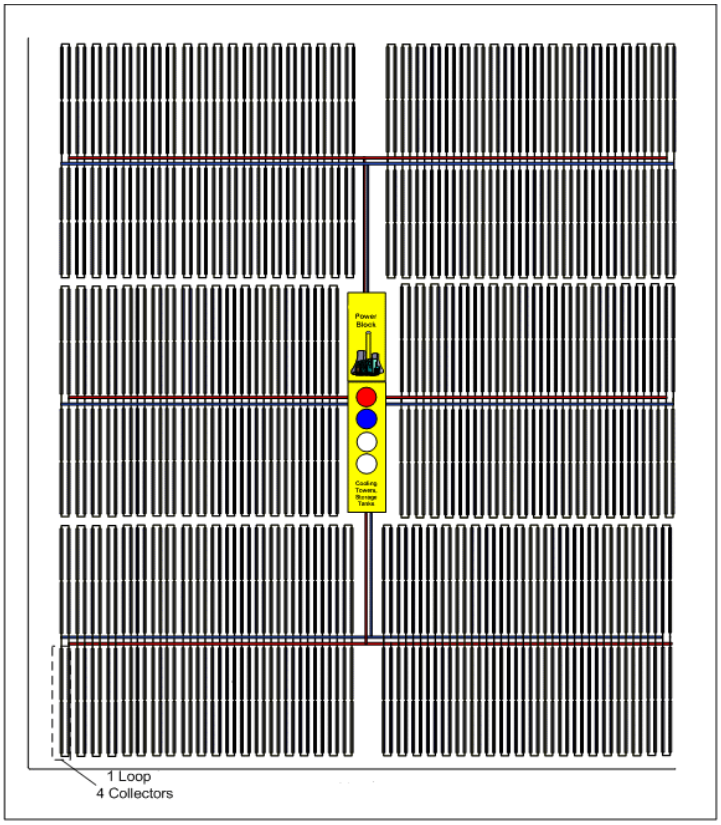


Figure 10: Detailed solar field and power block layout

The electrical and local control buildings, workshop buildings, electrical equipment buildings, and water treatment buildings (if wet cooling is used) will be located within the power blocks. The assembly hall building, temporary laydown area, parking area, office, evaporation and storm water ponds (if wet cooling is used), and 230 kV intertie switchyard will be located outside the solar field area. A single overhead 230 kV transmission line will connect the plant to the Valley substation.

All buildings will be of pre-engineered metal frame construction and assembled onsite except for the substation control building. This building will be a factory assembled structure with electrical and control equipment factory installed. Accessibility to buildings will be in full compliance with applicable codes and standards including the Americans with Disabilities Act.

The two salt storage tanks will each have a diameter of approximately 120 feet and are made of steel.

Power Block Buildings and Structures

1. Septic Field
2. Cooling Tower
3. Sodium Hydroxide and Acid Tanks
4. Circulating Water Pumps
5. SUS Transformer and 480 V Bus
6. Emergency Diesel Generator
7. Fire and Service Water Tank
8. Fire Protection Pumps
9. Main Auxiliary Transformers
10. Generator Step Up Transformer
11. 230 kV Breaker
12. 230 kV Take Off Tower
13. 230 kV Transmission Line
14. Electrical and Local Control Building
15. Administration Building
16. Generator Circuit Breaker
17. Steam Turbine
18. Parking
19. Heaters and Steam Generators
20. Solar Field Circulation Pump
21. HTF Piping Connection to Solar Field
22. Freeze Protection Pumps
23. HTF Heater
24. HTF Main Pumps
25. Workshop Building
26. Hot Salt Storage Tank
27. Oil-to-Salt Heat Exchangers
28. Cold Storage Pump
29. Hot Storage Pump
30. Cold Salt Storage Tank

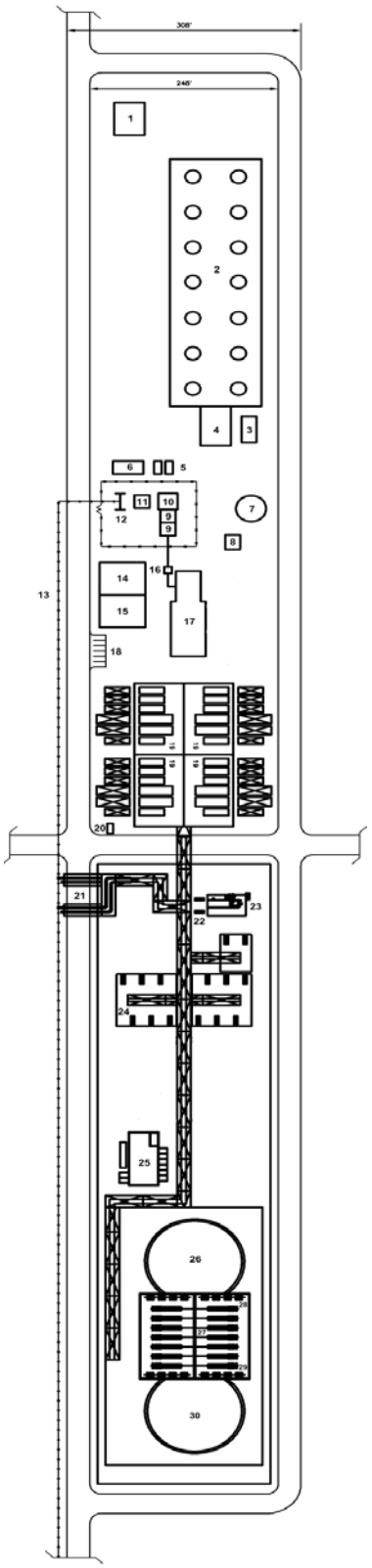


Figure 11: Power Block Detail

Suitable platforms and walkways will be provided per federal and state occupational health and safety requirements for areas requiring daily access (such as valves, instrumentation, controls, etc,). Manufacturer's standard doors or manholes will also be provided to allow access for inspection of equipment and critical areas.

If wet cooling is utilized, evaporation and storm water ponds will double lined and located partially above existing grade to allow surface water runoff to be directed away from the ponds.

The Projects' lighting system will provide operations and maintenance personnel with illumination in both normal and emergency conditions. The system will consist primarily of AC lighting, but will include DC lighting for activities or emergency egress required during an outage of the plant's AC electrical system. The lighting system will also provide AC convenience outlets for portable lamps and tools. Lighting will be designed to provide the minimum illumination needed to achieve safety and security objectives and will be shielded and oriented to focus illumination on the desired areas and minimize additional nighttime illumination in the site vicinity. All possible attempts to comply with the Clear Skies initiative will be made.

vi. Temporary construction workspace, yards, staging areas

An assembly hall will be built for storage of equipment and for field fabrication facilities. This building may become permanent depending on the need for additional permanent warehouses for spare parts or maintenance work. Indoor storage space will be required only for weather sensitive items, such as control/electrical panels, or small parts which could easily be misplaced. Some space for material, which requires temperature and humidity control will be provided. Other items will be stored outdoors on raised platforms with proper covers or temporary shelters. Construction area lighting will be provided at the warehouse locations. Construction subcontractors will provide their own warehousing facilities needed for material they furnish at the areas designated on the site laydown plan.

In addition to the permanent plant roads and parking, construction roads and parking will be required to provide access to construction facilities and the laydown area. Construction parking space will be provided near the construction office complex. These temporary roads will be all weather gravel surfaced (that is to say, they will utilize gravel of a grade sufficient to provide adequate road surfacing in any weather) and of sufficient width and location to accommodate efficient use and traffic pattern. The

parking area will have barriers to control parking pattern and locations. The construction parking area will be sized to accommodate approximately 400 vehicles.

vii. Geotechnical studies and data needs, including solar insolation testing

Solar Insolation Testing

Solar Millennium has a network of solar meteorological measurement stations recording data in the southwest United States, including a station located on nearby private property (see Figure 13 below) which is monitoring conditions at the site. Direct normal, global horizontal and diffuse horizontal irradiation as well as temperature, humidity, wind speed, and wind direction are measured and then recorded in one minute increments. Solar Millennium utilizes proprietary programs and expert personnel to calculate, validate, and present the key design conditions for its solar thermal power plants.

Figure 12: Solar monitoring station

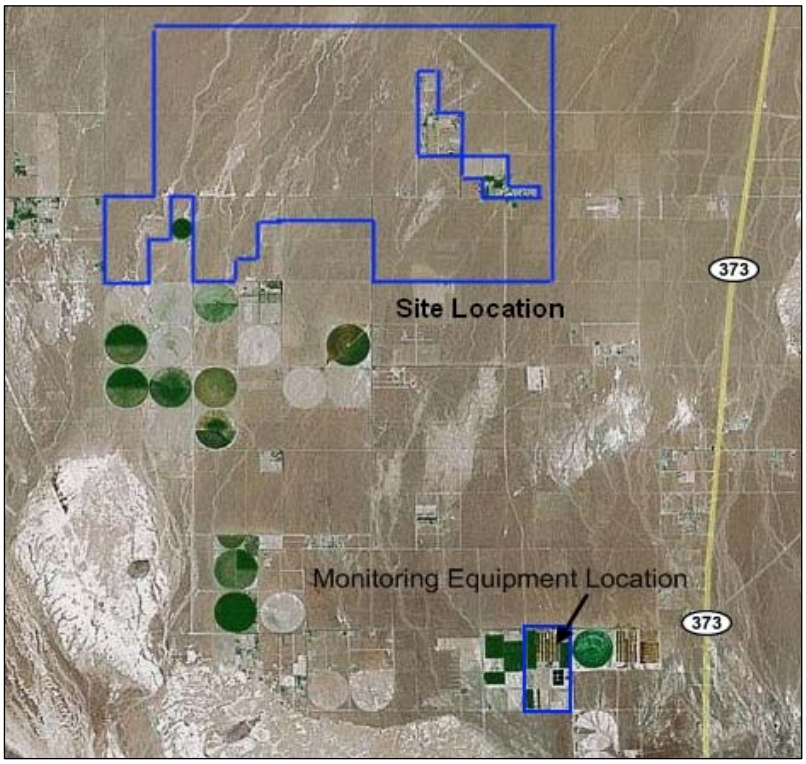


Figure 13: Location of local solar monitoring station relative to site

Geotechnical studies

A detailed geotechnical investigation will be conducted to confirm soil conditions for the facility equipment and structure foundation design. Borings will be required in advance of detailed engineering to assess soil conditions and hydrology.

Foundations for all equipment and structures, except the solar collector assemblies and power block utility racks, are assumed to be soil supported reinforced concrete spread footings or mat type foundations. Deep dynamic compaction (DDC) ground improvement for soils underlying the power block structures may be utilized.

The power block utility rack foundations will be drilled pier foundations. Dewatering may be required if the water table is not below the bottom of all foundation and underground utility excavation works. Rock excavation may also be required if bedrock is not below all drilled pier, trench and site grading excavations.

viii. Ancillary facilities (administrative, maintenance facilities and storage sites)

A temporary construction laydown area and the temporary assembly hall building are located adjacent to the solar fields. The assembly building may be converted to maintenance and spare parts facilities once the plants are in operation.

ix. Water usage, amounts, sources

The water needs for construction and operation of the facilities will require a dedicated source of water supply, with the quantity of water required depending on whether the facility is dry- or wet-cooled. For more information on wet vs. dry cooling, please see Exhibit 5.

For wet cooling, each plant would require 2,000 acre feet per year. Approximately 91% of that quantity is required for power plant cooling. The remainder is split between needs for mirror washing and steam cycle make-up water. The facility will contain all water from "blowdown" sources in the on-site evaporation pond.

The primary potential water source is diversion of agricultural water from existing, active wells near the periphery of the proposed project. Determination of the availability and suitability of this water is under investigation.

Solar Millennium understands the issues and concerns that prevail in Nevada and throughout the desert southwest regarding the use of water for evaporative cooling and is evaluating the feasibility and suitability of both wet and dry cooling for these projects. Water sources for cooling contemplated for the Projects will not be suitable for municipal water use. A dry cooled facility would reduce water consumption to approximately 200 acre feet per year.

The table below illustrates the water consumption amounts associated with either the wet or dry cooling alternative.

Water Consumption Requirements
242 MW Parabolic Trough Solar Plant
3.5 Full-Load Hours of Energy Storage

Water Consumption In Annual Acre-Feet*	**Evaporative Cooling**	**Dry Cooling**
Power Cycle Heat Rejection	**2,700**	**-**
Ancillary Equipment Heat Rejection	**-**	**30**
Mirror Washing	**140**	**140**
Power Cycle Makeup Water	**130**	**130**
Dust Suppression	**30**	**30**
Domestic Potable Water	**8**	**8**
Total	**3,008**	**338**

Table 1: Wet and Dry Cooling – Water Consumption Requirements

3,008 acre-feet is roughly equivalent to the annual water consumption of a **600** acre farm in the Amargosa Valley (assuming typical agricultural water consumption of 5 acre-feet per acre of irrigated land).

338 acre-feet is roughly equivalent to the annual water consumption of a **60** acre farm, using the same assumptions.

x. Erosion control and stormwater drainage

The Projects' erosion control and stormwater drainage control plan will meet the following objectives:

- Protection of the facilities from stormwater damage
- Compliance with the water retention requirements of Nye County
- Minimization of downstream effects of stormwater flow

Solar Millennium understands the BLM's concerns regarding the management of stormwater flow both within and around the Project site. Diversion channels, berms, and a stormwater retention pond will be used as necessary to minimize both the release of water and sediment impacts downslope. A storm sewer system utilizing buried piping and catch basins for storm water inlet may be utilized if necessary, and dry washes, ditches, etc. draining onto or through the Project site may require rerouting around the Project site. A drainage channel system will be provided around the perimeter of the solar fields as required to prevent flooding from a 100 year storm. Detailed topographical modeling and modeling of stormwater velocity will be undertaken to develop a site-specific stormwater drainage and erosion control plan, which will be presented to the BLM separately.

Drainage channels will be installed within the solar field areas. A significant portion of the drainage channels will be lined. The area between drainage channels will be sloped towards the channels. Additional drainage channels will be installed around the power block area and will convey non-contact storm water to the solar field drainage channels. Storm water from contact or potentially oily contact areas such as plant equipment drains will be routed to a local oil/water separator.

Storm water management will incorporate best management practices and meet the requirements of Nye County. Process wastewater will be collected and routed to the wastewater evaporation pond. Storm water discharges from construction activities that disturb one or more acres of land require a NPDES General Permit for Construction Activity. Appropriate best management practices will be implemented for construction activities. A Storm Water Pollution Prevention Plan (SWPPP) for construction will be prepared.

The FEMA flood maps shown in Exhibit 6 show that the Project site is located entirely in areas marked "Zone X" – "Areas of 500 year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than one square mile, and areas protected by levees from 100-year flood"; also, "Areas determined to be outside 500 year flood plain"

xi. Vegetation treatment and weed management

A vegetation treatment and weed management program will be adopted in consultation with Nye County and the BLM. A noxious weed study will be carried out concurrently with the springtime vegetation studies to be prepared for the EIS.

xii. Waste and hazardous materials management

Non-hazardous solid waste will consist primarily of construction and office wastes which will be trucked to the nearest Type II landfill or to a nearby transfer station. Non-hazardous liquid waste will consist primarily of domestic sewage waste; we are considering installation of a septic system as one alternative. Two methods for removing potential hazardous material are by hauling to an approved Type III hazardous waste site or on-site microbial treatment.

xiii. Fire protection

Fire protection systems are provided to limit personnel injury, property loss, and Project downtime resulting from a fire. The systems include a fire protection water system and portable fire extinguishers.

The fire water system capacity will be at least equal to the flow rate required for the largest single fire hazard, plus a 500 gpm allowance for two hose streams.
The Project's fire protection water system will be supplied from an underground fire main located on the plant site. Electric or diesel-fueled firewater pumps will deliver water to the fire protection water-piping network.

The piping network will be configured in a loop so that a piping failure can be isolated with shutoff valves without interrupting the supply of water to a majority of the loop. The piping network will supply fire hydrants located at intervals throughout the power plant site, a sprinkler deluge system at each unit transformer, HTF expansion tank and circulating pump area and sprinkler systems at the STG and in the operations and

administration buildings. Portable fire extinguishers of appropriate sizes and types will be located throughout the plant site.

Fire protection for the solar field will be provided by zoned isolation of the HTF lines in the event of a rupture that results in fire. As vegetation or other combustible materials will not be allowed in the solar field, the HTF will be allowed to extinguish itself naturally, since the remainder of the field is of nonflammable material (aluminum, steel, and glass).

All fire protection systems and components will be designed and supplied in accordance with the appropriate requirements of the local fire marshall. All fire pump equipment will be UL listed, and FM approved and designed in compliance with NFPA 20 and 850 recommendations. All fire pump equipment will be located in an enclosed building with sufficient room for access to facilitate equipment maintenance. The underground fire main will supply firewater throughout the power block area. The fire main will be looped, and will supply water to fire hydrants, hose stations and fixed water suppression systems installed in buildings and elsewhere around the plant. The underground fire main will be an FM-approved, high density polyethylene (HDPE) piping. Fire protection for the solar field will be provided by installation of isolation valves in the HTF piping and an on-site plant fire fighting foam truck.

A more detailed fire protection plan is being prepared for presentation to the BLM.

xiv. Site security and fencing (during construction and operations)

Site guards will be trained, uniformed, unarmed personnel. Their primary responsibility will be to control egress and exit of personnel and vehicles, perform fire and thieving watch during off hours, and perform security badge administration. A project wide photo security badge system for all construction and operations personnel will be used to control security.

Guardhouses will be constructed at the main entrance gate for delivery vehicles, at the construction pedestrian entry point adjacent to the parking area and at the entrance to the solar collector assembly/laydown area.

The perimeter of the project site area will be fenced with an 8’ high security fence. Final fencing material will be determined with advanced engineering.

xv. Electrical components, new equipment and existing system upgrades

A new 230 kV overhead transmission line ("gen tie line") will be built from the Project substation to the Valley substation. The routing of this line has not yet been designated.

xvi. Interconnection to electrical grid

The Project electrical components consist of the solar field electrical systems, the power blocks, the project substation, and the 230 kV gen tie line. The site is located within four miles of the Valley substation. The proposed point of interconnection is to the Valley substation, which will be upgraded to 230 kV and connected to a new Valley Electric 230 kV transmission line to be constructed between the Valley and proposed Johnnie substations.

The electrical output of the steam turbine generator (STG) will be stepped up to 230 kV through an oil-immersed step-up transformer located in the plant substation.

The plant substation ground grid will be connected to the generation plant ground grid and will consist of copper conductor throughout the yard with ground rods installed around the perimeter and near major equipment. A layer of aggregate will be installed above grade to increase contact resistance within fenced substation area.

xvii. Spill prevention and containment for construction and operation of facility

The chemicals on-site include the following:

- Diphenyl/biphenyl oxide
- Caustic (Sodium hydroxide)
- Acid (Sulfuric acid)
- Algaecide (Slimicide C-31) or chlorine equivalent
- Oxygen Scavenger (Powerline 1405)
- Liquid Propane Gas
- Lubricating Oil

Material safety data sheets for these chemicals are provided in Exhibit 2.

Oil-filled Transformers

Secondary containment structures will be provided around any oil-filled transformers located outdoors, STG lube oil tanks, HTF overflow and expansion vessels and any other oil containing tanks over 55 gallons without double walls or vendor supplied secondary containment. The containment will be sized to contain 125% of the fluid in the transformer or vessels with appropriate freeboard required per code. Additional equipment (such as HTF pumps, feedwater pumps, etc.) will be provided with 6 inch tall curbs as appropriate. Containment designs will be based on manual cleanup, with a portable sump pump.

Heat Transfer Fluid

Heat transfer fluid (HTF), diphenyl/ biphenyl oxide (trade name Therminol or Dowtherm), requires periodic make-up due to the minor fluid degradation that occurs during the cyclic operation as well as due to the effects of vaporization (losses from pump seals, valve packings, and other mechanical joints), and unplanned spillage. The HTF make-up quantity projected is based on annualized losses of 2% by volume, consistent with actual experiences of fluid loss at Kramer Junction.

Heat Transfer Fluid Spill Remediation

The HTF fluid for the solar fields will be diphenyl/biphenyl oxide. Dowtherm A and Solutia VP-1 are commercial products that have been used in trough plants to date, and one of these products will be used in this project. The diphenyl/biphenyl oxide mixture (CAS numbers 101848 and 92524, respectively) is not classified as a hazardous material by the U.S. Dept. of Transportation, nor is it listed under U.S. EPA CERCLA regulations. However, this material, when discarded, may be a hazardous waste as that term is defined by the Resource Conservation and Recovery Act (RCRA), 40 CFR 261.24, due to its toxicity characteristic. We will make accommodations for on-site handling of wastes as described below.

While the collector design has advanced to an excellent level of performance and reliability, occasional small spills of HTF do occur, primarily due to equipment failures. The solar trough plants at Kramer Junction have reduced HTF spills due to accidents or pipe rupture to very low levels. Good maintenance practices and the use of ball joint assemblies rather than flexible hoses in the HTF system are the major contributors to this improvement.

In addition, safe handling of HTF-contaminated soils from accidental spills has been demonstrated at solar trough facilities. Spill management procedures are in place to

report, contain and clean up any accidental spills. If a line worker or other staff observes a spill or release the system operators in the power block will be notified and the affected collector loop shut down. An appropriately equipped crew will make any necessary equipment repairs and remove any hazardous wastes to an onsite bioremediation facility that utilizes indigenous bacteria to digest the hydrocarbon contamination. A combination of nutrients, water and aeration is provided to facilitate the bacterial activity where microbes restore the soil to a normal condition in two to three months. The photograph below shows HTF-contaminated soil being aerated with a tractor-drawn plow.

Figure 14: Bioremediation of HTF-Contaminated Soil (Source: Kramer Junction Company)

xviii. Health and safety program

The health and safety program will be designed to meet or exceed all applicable federal and state health and safety standards and associated codes to provide a healthful and safe environment for workers and the public. During construction and operation the projects will be covered by a health and safety program, and all personnel will be trained through this program. The proposed program is a multifaceted plan that includes the following four major elements:

- Safety program, including safe work practices, procedures, and inspections.
- Accident and disaster response plans, including response procedures, recordkeeping, and follow-up.
- Chemical monitoring program, including proper storage and handling of chemicals and recordkeeping.
- Training program, including on-the-job and new employee safety training courses, and training in the use of personal protection devices, fire brigade, and first aid.

The plants will be equipped with onsite fire protection that is compliant with all regulations and specifications.

d. Other Federal, State, and Local Agency Permit Requirements

i. Identification of permits

Solar Millennium is involved in solar power project development activities throughout the world and is familiar with environmental permitting requirements in numerous jurisdictions. From an environmental standpoint, solar parabolic trough facilities do not present significant environmental impacts. Air emissions associated with generating electricity from solar technologies are negligible. Solar-thermal technologies do not produce a substantial amount of solid waste while creating electricity and while solar-thermal technologies may require a significant amount of land, depending upon the specific solar-thermal technology used, solar energy installations do not usually damage the land they occupy. A list of government agencies involved can be found below in Table 2.

As the projects planned for this site are located on federal land administered by the BLM, they must comply with the National Environmental Policy Act (NEPA). The proposed project must also comply with the requirements of the Endangered Species Act (ESA), the, Sections 401, 402, and 404 of the Clean Water Act (CWA), Section 106 of the National Historic Preservation Act, and the Native Indian Religious Freedom Act, among others.

<u>Land Use</u>

In 1976 Congress passed the Federal Land Policy and Management Act (FLPMA) which directed the BLM to inventory and develop a comprehensive land use management plan

for the provides the management framework for the BLM's multiple-use mandate. Operating under a multiple-use mandate and as defined by FLPMA, BLM is responsible for managing public land and their various resource values to achieve the following objectives:

- utilize resources in the combination that will best meet the needs of present and future generations,
- make the most judicious use of resources while providing for periodic adjustments in use to conform to changing needs and conditions,
- the use of some land for less than all of the resources,
- a combination of balanced and diverse resource uses that take into consideration the long-term needs of future generations for renewable and non-renewable resources, and
- harmonious and coordinated management of the various resources without permanent impairment of the productivity of the land and the quality of the environment with consideration being given to the relative values of the resources and not necessarily to the combination of uses that will give the greatest economic return or greatest unit output.

BLM's multiple-use land management is predicated on the principle of sustained yield, which can be defined as "the achievement and maintenance in perpetuity of a high-level annual or regular periodic output of the various renewable resources of the public lands consistent with multiple-use."

Las Vegas District Resource Management Plan and Record of Decision: Consistent with its mandate, BLM developed a land management plan for the area to address regional resource and land management issues. The Las Vegas RMP, adopted in 1998, is the guide for development on BLM land in the project area.

Nye County Government: The project is located within Nye County. The county will have jurisdiction over several permits which are outlined below.

Federal Aviation Administration: As the project is not adjacent to an airport, Federal Aviation Administration requirements are not applicable.

The proposed Projects will conform to applicable federal, state, county and local laws and regulations. Table 2 below presents the approvals, reviews and permitting requirements anticipated to be needed for the development, operation and construction of the projects.

Table 2: Permits and Authorizations

Permit or Approval	Agency	Basis and Requirements	Underlying Reasons for Obtaining	Timeline
FEDERAL				
Application for Transportation and Utility Systems and Facilities on Federal Lands (SF 299) ROW Authorization Permit)	BLM	This ROW Authorization permit serves all commercial solar energy facilities per BLM Instruction Memorandum No. 2007-097, April 4, 2007 (BLM Solar Energy Development Policy).	This application starts the process to gain right of way on BLM land. The SF 299 has been filed already; however, additional applications may be required for the Project water pipeline (if any), and transmission line.	Complete application 45 – 60 days
Plan of Development	BLM	NEPA Plan for construction and operation of solar facility must be completed prior to beginning construction. Plan provides full project description including applicant information, site location, maps, and proposed operating plan.	Part of application process for obtaining the federal ROW grant.	Submit with or soon after SF299
Form 2920	BLM	NEPA	For geotechnical investigations	

Permit or Approval	Agency	Basis and Requirements	Underlying Reasons for Obtaining	Timeline
Environmental Impact Statement (EIS)	BLM – National Environmental Policy Act (NEPA)	NEPA An evaluation of the project's effects on natural and human resources to determine the potential for significant impacts.	Activities which result in the environmental effects that meet the definition of significance.	
National Historic Preservation Act (NHPA)	BLM	Section 110; EO115931. Archeological contractor needs to complete Class I inventory (e.g. file search for sites within area of potential effect (APE)). 2. Archeological contractor needs to complete 100 percent Class III survey of APE. 3. If any historic structures are present, additional documentation could be needed.	Required to comply with federal regulations and complete the EA and/or EIS.	With EA and/or EIS
Air Quality Conformity Analysis	BLM – National Ambient Air Quality Standards (NAAQS) and the Federal Clean Air Act (CAA)	CAA Will need project description, emission sources, types, rates, and operating schedule	Will be incorporated in the EIS Process (under the Air Quality impact topic)	With EA and/or EIS

Permit or Approval	Agency	Basis and Requirements	Underlying Reasons for Obtaining	Timeline
National Historic Preservation Act (NHPA),	BLM to contact Nevada State Historic Preservation Office and Tribal Historic Preservation Office [as appropriate]	Section 106 Review (36 CFR 800) The Project does not require permits. Information for Section 106 compliance would be based partly on findings of a Class III archeological survey. Contractor would prepare draft letters.	The Nevada State Historic Preservation Officer, Department of Parks and Recreation and appropriate Tribal Historic Preservation Officers must be consulted when projects are subject to review under Section 106 of the NHPA. This act requires that all federal agencies take into account the affect of their actions on historic properties (properties on or eligible for the National Register of Historic Places). Requirements of Section 106 review apply to any federal undertaking, funding, license, or permit. The Advisory Council on Historic Preservation (ACHP) must be provided an opportunity to comment.	With EA and/or EIS

Permit or Approval	Agency	Basis and Requirements	Underlying Reasons for Obtaining	Timeline
Cultural Resource Use Permit	BLM, State Office	Permit to be obtained by archeological contractor; application includes outline of proposed work; name of institution and project principal investigator; dates of field work; type of investigations; description of site(s) with specific location information; and copy of agreement with institution where collections would be preserved.	Archeological contractor to obtain Cultural Resource Use Permit from BLM prior to beginning work. Many Contractors may already have permits.	With EA and/or EIS
Field Use Authorization	BLM - Local Field Office	Holder of Cultural Resource Use Permit obtains a Field Use Authorization for the project from BLM field office. Submit reports during/after project.	Contact appropriate Field Office Archeologist. Field Authorization Form requests specific information on the location, schedule and nature of the archeological fieldwork and allows BLM to communicate specific constraints on a project type, schedule or location.	With EA and/or EIS

Permit or Approval	Agency	Basis and Requirements	Underlying Reasons for Obtaining	Timeline
Archaeological Resources Protection Act (ARPA) Permit	BLM	Archaeological Resources Protection Act (ARPA) of 1979, as amended, Section 4 Holder of Cultural Resource Use Permit, provides a research design and plan of work for the research project to obtain an ARPA permit.	This permit would be needed IF subsurface investigations are needed to identify the National Register of Historic Places significance of an identified site.	With EA and/or EIS
Department of Defense R 2508 Complex Sustainability Office review and approval	DOD - U.S. Department of Defense	Review the project and its potential impact on military overflights and operations.	A letter from the DOD, stating that construction and operation of the array would not adversely affect DOD operations will be sufficient to meet this requirement; such a letter would be included in the EIS and submitted to the County Planning Department.	
Prevention of Significant Deterioration (PSD)	EPA - U.S. Environmental Protection Agency	Will need project description, emission sources, types, rates, and operating schedule.	It is unlikely that a PSD permit will be required based on the current project description.	

Permit or Approval	Agency	Basis and Requirements	Underlying Reasons for Obtaining	Timeline
Title V Federal Operating Permit (if required)	EPA – National Ambient Air Quality Standards (NAAQS) and the Federal Clean Air Act (CAA)	Will need project description, emission sources, types, rates, and operating schedule.	It is unlikely that a Title V permit will be required based on the current project description.	
EPA Identification Number	EPA	As a generator of hazardous waste, the Project will be required to obtain an EPA identification number from the Department of Toxic Substances Control (DTSC). DTSC delegates some authority to local fire department hazardous materials divisions.		
Section 404 permit: Preconstruction Notification or Individual Permit	USACE - U.S. Army Corps of Engineers	Delineation and Permit	When impacting Waters of the U.S.	
Qualifying Facility/Exempt Wholesale Generator Certification	Federal Energy Regulatory Commission (FERC)	Certification required to qualify for benefits under Public Utilities Regulatory Policies Act.	Only if applicable.	

Permit or Approval	Agency	Basis and Requirements	Underlying Reasons for Obtaining	Timeline
No Hazard Declaration	Federal Aviation Administration	Federal Regulation Title 14 Part 77	Establishes standards and notification requirements for projects affecting navigable airspace. (Need declaration from the FAA that the project presents no hazard to navigable air space).	
Biological Opinion/Incidental Take Permit	USFWS - U.S. Fish and Wildlife Service	Endangered Species Act (ESA) Section 7 Consultation, Biological Assessment	If listed species are present on the project site, formal consultation with USFWS is needed to request concurrence with biological assessment to be prepared as part of EIS. Would require site surveys by qualified and certified wildlife biologists.	

Permit or Approval	Agency	Basis and Requirements	Underlying Reasons for Obtaining	Timeline
UEPA (Utility Environmental Protection Act)	Public Utilities Commission of Nevada (PUCN)	Nevada Revised Statue (NRS) 704.870 Similar to the EIS described above	Permit required to construct a Public Utility in Nevada. Does not apply to persons who produce energy for sale to public utilities. [NRS 704.021(4)]	Will follows EIS timeline
Operating Permit Class I, II, or III depending on calculated Potential to Emit.	Nevada Department of Environmental Protection Bureau of Air Pollution Control (NDEP BAPC)	Nevada Administrative Code (NAC) Chapter 445B Will need project description, emission sources, types, rates, and operating schedule	Applications for operating permits outside of Clark County.	14 months prior to start of procurement of equipment and/or construction. Whichever comes first.
Stand Alone Surface Disturbance Permit (SAD)	Nevada Department of Environmental Protection Bureau of Air Pollution Control (NDEP BAPC)	NAC 445B Will need project description, boundaries, dust control plans, and operating schedule.	Required for construction activities disturbing more than 5 acres.	Prior to start of surface disturbance.

Permit or Approval	Agency	Basis and Requirements	Underlying Reasons for Obtaining	Timeline
NPDES Construction Activities Storm Water General Permit	NDEP Bureau of Water Pollution Control	NAC 445A SWPPP and NOI	Required for land disturbance of greater than 1 acre. Permit application needs applicant information, project description, including size of area to be affected and other environmental permits associated with the project, as well as use of BMPs.	2 days prior to start of constructi on
General Storm Water Permit for Industrial Activities	NDEP Bureau of Water Pollution Control (BWPC)	Permit requires applicant information, site location information, a storm water pollution prevention plan (SWPPP), a monitoring plan, and site maps.	This is a separate SWPPP and NOI from that required for construction	NOI must be submitted at least 48 hours before a discharge of stormwat er associated with industrial activity occurs. NDEP has 30 days to approve.

Permit or Approval	Agency	Basis and Requirements	Underlying Reasons for Obtaining	Timeline
Groundwater Discharge Permit	Nevada Division of Environmental Protection (NDEP) Bureau of Water Pollution Control (BWPC)	Temporary Permit ($250 fee) Narrative Description, Water Quality Analysis, Quantity of Discharge	Temporary permit needed for discharge associated with construction activities. Discharge permit not expected to be needed for operation activities.	Temporary permit may be issued for up to six months and will take 2 - 4 weeks to get
Small Commercial Septic Systems	Nevada Division of Environmental Protection (NDEP) Bureau of Water Pollution Control (BWPC)	Submit commercial septic plan submittal form with $200 fee	Must submit two copies of drawings, plans and specifications for system(s) wet stamped by a registered Nevada professional engineer. If septic needed.	NDEP has 30 days to approve.
EPA Identification Number	Nevada Division of Environmental Protection (NDEP) Bureau of Waste Management	Submit a complete EPA Form 8700-12 "Notification of Regulated Waste Activity" application form	Need only if Generator of Hazardous Waste (>220 lbs/month) Do not apply for EPA ID # unless actually come close to 220 lbs/month generator status	Complete forms take up to 15 days to issue number

Permit or Approval	Agency	Basis and Requirements	Underlying Reasons for Obtaining	Timeline
Hazardous Materials Storage	State Fire Marshall	Need complete details and specifications on flammable, explosive, or hazardous materials that would be on-site, along with quantities of each substance and storage and handling procedures.	Need only if quantities of hazardous materials stored onsite exceed thresholds.	Submit Application within 30 of operations.
Nevada Chemical Accident Prevention Program (NV CAPP) Permit to Construct	Nevada Department of Environmental Protection Bureau of Air Pollution Control (NDEP BAPC)	Design and construction plans, process hazard analysis, emergency response plan, identify HAZMAT response capability.	CAPP applies in facilities that have select, highly hazardous substances in quantities above defined thresholds.	12 to 18 months prior to construction.
Nevada Chemical Accident Prevention Program (NV CAPP) Permit to Operate	Nevada Department of Environmental Protection Bureau of Air Pollution Control (NDEP BAPC)	Management of change plan, pre-startup safety review plan, preventative maintenance plans, process hazard analysis plan, standard operating procedures, and training plans.	CAPP applies in facilities that have select, highly hazardous substances in quantities above defined thresholds.	Prior to Operations

Permit or Approval	Agency	Basis and Requirements	Underlying Reasons for Obtaining	Timeline
Nevada Department of Transportation Right-of-Way Occupancy Permit	Nevada Department of Transportation (NDOT)	NRS 408 Required when state highway ROW would be affected. Requirements are plan sheets and full description of the encroachment on state ROW.	If necessary	12 months prior to encroachment/ occupancy
Nevada Department of Transportation Super Load Permit	Nevada Department of Transportation (NDOT)	Required when Extraordinarily large or oversized equipment traveling on state roads or unusual impacts to traffic are anticipated.	If necessary	Apply at least 20 working days prior to oversize load on State highways
Water Rights	Nevada Department of Conservation and Natural Resources Department of Water Resources	General project description, location, water requirements, maps.	Water rights will most likely need to be obtained from a private owner.	Dependant on availability. If water available 4-6 months request for permission to use.
Business Tax License	Nevada Department of Taxation	Business description	Required	Upon starting business in Nevada.

Permit or Approval	Agency	Basis and Requirements	Underlying Reasons for Obtaining	Timeline
Boiler & Pressure Vessel Certificate	NV Industrial Relations Division	Pre3ssure vessel specifications and certifications.	Pressure Vessel Installation Contractor will apply for and receive certificate.	1 week for review and approval
Drinking Water Permit	NV Health Division	Prepare and submit application	Permit may be required if 25 or more employees on location for more than 60 days.	4-6 weeks permit issuance.
Endangered Species Incidental Take Permit	Nevada Fish and Wildlife Office (NFWO)	NFWO will be invited to participate in the Section 7 consultation with USFWS by BLM regarding species protected under both the ESA. Would require site surveys by qualified and state-certified wildlife biologists	Discussions need to be initiated with NFWO regarding a Section 2081 take permit only for species listed under ESA.	ESA permitting can likely be completed at the same time as USFWS permitting /consultation
LOCAL (Nye County)				
Building permits	County Building Division	Submit building plans	Building Permit will be needed for any structures.	Not required in Nye county outside of Pahrump.
Business License	Nye County License	Required for Conducting business in Nye County. Administrative requirement		1 month

Permit or Approval	**Agency**	**Basis and Requirements**	**Underlying Reasons for Obtaining**	**Timeline**
Fire Safety Compliance Certification	Nye County Bureau of Fire Prevention	Building and operation fire safety		2-3 weeks review and approval
Flood Damage Prevention Permit	Nye County Planning Departmen t	Certification of flood zone location.	Land development within an area of special flood hazard	10 days review and approval
Encroachment Permit	Nye County Departmen t of Public Works	Type, location, duration, of encroachment.	Needed if there is encroachment onto public roadways.	2-3 weeks review and approval
Industrial User Discharge Permit	Local Publicly Owned Treatme nt Works (POTW)	Details of the sewage disposal system and waste volumes.	Assumption: the solar facility would discharge wastewater via sanitary sewer connection	2 – 3 months review and approval

Application for Transportati on and Utility Systems and Facilities on Federal Lands (SF 299) (ROW Authorizatio n Permit)	BLM	This ROW Authorization permit serves all commercial solar energy facilities per BLM Instruction Memorandum No. 2007-097, April 4, 2007 (BLM Solar Energy Development Policy).	This application starts the process to gain right of way on BLM land. The SF 299 has been filed already; however, additional applications may be required for the Project water pipeline(s) (if any) and transmission line.	Complete application 45 – 60 days

ii. Status of permits

No permits have yet been sought for the proposed projects.

e. Financial and Technical Capability of Applicant

The Solar Millennium Group has built a strong team that is technically as well as financially competent for this development. Solar Millennium is currently involved in the development and construction of a three-unit solar power park (similar to that defined here) in southern Spain, and is in the early stage of development of more multi-unit projects elsewhere in Spain. In addition, Solar Millennium is involved in the development of an integrated solar/gas combined cycle plant in Egypt and is in an early development phase in China.

Parabolic trough solar power technology is the only solar thermal power technology that has a proven performance and commercial record on a large commercial and industrial scale. Nine plants with a total capacity of 354 MW, built in the Mojave Desert in the 1980's and early 1990's, are all still running today. Their solar field performance at the Kramer Junction site, as a case in point, has consistently exceeded their design values during the important peak power demand period. Since 2004, this technology has experienced a strong revival, specifically in the Spanish power market. Today, 4 plants with an accumulated capacity of 130 MW are under construction in Spain co-owned and engineered by the Solar Millennium Group., and there is a pipeline of another 800 MW of projects that are already fully permitted. No other concentrating solar power technology can boast a technical or commercial performance track record remotely approaching that of parabolic trough. In short, it is by far the most likely technology to succeed.

Detailed information about Solar Millennium, including our 2006/2007 annual report can be found at: http://www.solarmillennium.com/

2. Construction of Facilities

a. Solar field design, layout, installation and construction processes including timetable and sequence of construction

The plant site has a footprint of 6.5 square miles, the majority of which is the solar field. The field size may be moderately adjusted, within the right-of-way area, based on further engineering and site constraints. Should wet cooling be utilized, in addition to

the solar field and power block areas, each plant will use a zero wastewater discharge system with an evaporation pond to accommodate blowdown from the cooling tower.

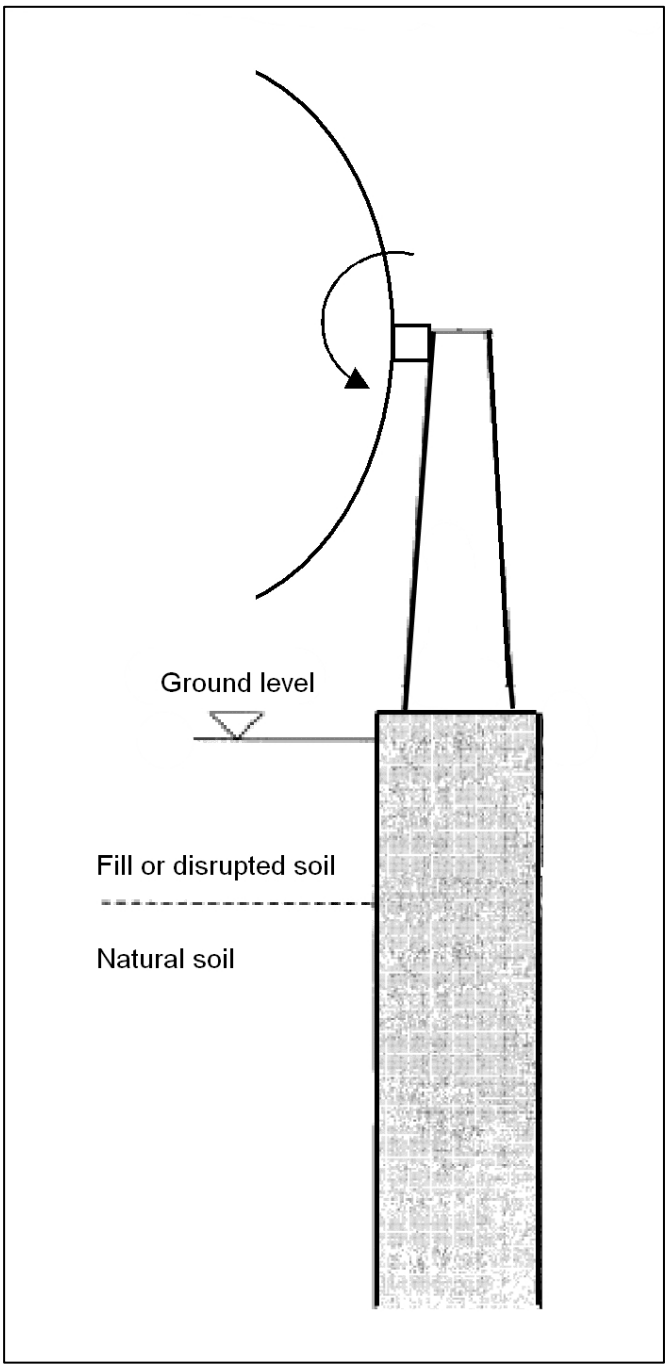
Figure 15: Collector loop at Kramer Junction

Significant earthwork will be required early in the construction phase of the Projects. The site will be appropriately terraced and dikes will be constructed on the periphery of the solar field most susceptible to flooding during severe rain storms. Extreme care will be taken to minimize the off-site impacts of this earthwork.

Site filling, backfilling, and embankment construction will be monitored during placement of material and tested for conformance with compaction requirements specified. Appropriate measures will be taken to maintain site drainage and flood protection during construction. The entire site will be protected against erosion, and any municipal drainage systems will be protected from silt deposits. A secure chain-link desert tortoise-proof fence will be installed around the perimeter of the Project site. For a further description of desert tortoise fencing standards as currently proposed by the Federal Department of Fish and Wildlife, please see Exhibit 3.

Site Work and Solar Field Foundations

Site work and solar field foundation preparation will include the following tasks:



- Earthwork, main entrance and construction personnel entrance roads, preparation of the solar collector assembly area, storage area, parking area and construction office area and installation of temporary and permanent site utilities

- Construction of the flood bypass channels

- Installation of solar and piping drilled piers, sequenced with earthwork. Installation of underground piping and electrical systems will be sequenced consistent with orderly evacuation and placement of concrete foundations. Concrete foundations are required throughout the solar field, for the turbine pedestal, for the control and maintenance buildings and for the cooling tower basins. Concrete will be procured from local batch plants.

Figure 16: Example of foundation

Final depth will depend on whether a spread footing or drilled pier foundation is used. Foundation design will be based on the results of the geotechnical investigation.

Solar Field Installation Workflow

- **Solar collector element assembly.** An assembly line will be erected in the site fabrication and storage area. Assembly line fabrication consists of assembly of the solar collector element structural steel components and the mounting of the mirror panels.

- **Field assembly** - The solar collector element assembly will be transported to the field by truck and trailer and lifted with a spreader bar and crane and set on end, middle, shared or drive pylons, and then aligned (if the wind speed is less than 12 km/hr). The alignment takes approximately 2-3 hours. The HCE's are installed (three preassembled welded sections) in the field and the ends are welded to an adjacent solar collector element. Ball joint assembly and assembly of measuring equipment will follow.

- **Solar Field Commissioning** – Solar Collector Assembly (SCA) Loops will be commissioned on an ongoing basis as they are completed during the installation of the solar collection field.

Power Block

- Power block foundations will start shortly after the start of solar field drilled piers.

- The Power Blocks will be erected and commissioned in parallel with the solar collection field.

Facilities Outside the Solar Field Boundary

- Construction of the evaporation pond, storm water retention pond, HV intertie, warehouse and gatehouse will run concurrent with construction of the power plants and will be commissioned to support the startup of the plants.

Transmission Line

During construction of the transmission line there will be temporary pulling and tensioning sites, material staging sites, and concrete batch plants.

There will be no grading at the pole site work areas or the pull and splicing site; rather, vegetation will be crushed. The pole site work areas, pull sites, and splicing sites within sensitive habitat will result in temporary disturbance that would be considered permanent based on slow recovery time of habitats in desert ecosystems.

Dust Control

Air impacts associated with the construction and operational phases of the Projects will be minor but include fugitive dust emissions (during construction) and small amounts of natural gas use (during operation). Air quality management district permitting and offset requirements will mitigate potential impacts.

Timetable and Sequence of Construction

Task	1st Half Year 1	2nd Half Year 1	1st Half Year 2	2nd Half Year 2	1st Half Year 3	2nd Half Year 3
Site prep, grading, roads						
Installation of piers, solar field prep						
Assembly of solar collector elements						
Installation of power block						
Installation of buildings, ponds						
Installation of substation, transmission line						

Figure 17: Construction Sequence

b. Phased projects, approach to construction and operations

Solar Millenium has experience with phased projects, through the company's Andasol projects in Spain. The company's approach to construction and operations of phased projects consists of maximizing synergies (e.g grading both solar field sites simultaneously, if possible) while minimizing impacts to traffic, etc.

c. Access and transportation system, component delivery, worker accesss

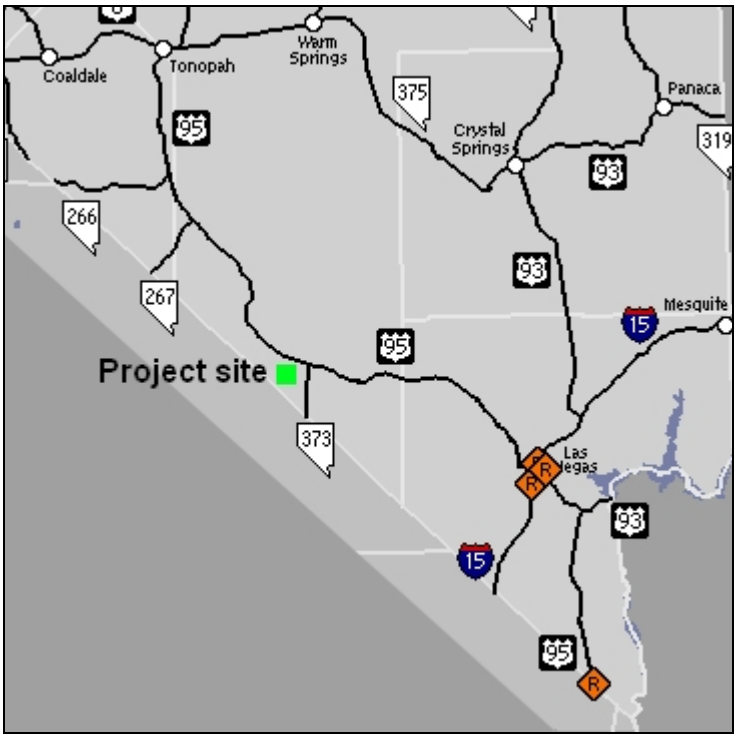


Figure 18: Transportation Map. Source: Safe Travel America

The site has immediate access from Hwy 373 and Amargosa Farm Road. The locations of the principal site entry gates for both the construction and the commercial operating period will be evaluated in consultation with the Nevada Department of Transportation and the Nye County Road Department to ensure access and egress from the site does not have adverse impacts on traffic flow. It is likely that the majority of workers arriving at the site and trucks carrying equipment will originate in Las Vegas, taking Highway 95 to Hwy 373, and turning off on Amargosa Farm Road.

d. Construction work force numbers, vehicles, equipment, timeframes

Construction will be managed by Solar Millennium. Several dozen major and minor subcontractors will be hired to undertake the myriad of mechanical, civil and electrical construction tasks. We have begun the process of identifying and qualifying critical subcontractors to support the project construction schedule.

Prior to mobilization for construction, a detailed construction plan will be developed to define the construction supervisory and technical field organizations and staffing levels required for the project. On average 500 construction and supervisory personnel will be required on site to construct the plant, with 850 personnel being required at its peak.

Construction will require surveyors, inspectors, linemen, laborers, operators, supervisors and biological monitors. Several types of vehicles including personnel transport, water wagons, bulldozers, motor graders, paddle-wheel loaders, pan scrapers, track-mounted backhoes, front-end loaders, dump trucks, construction equipment, material delivery and line trucks will be present during construction. Not all personnel involved in construction will be on the project site at the same time.

Construction will generally follow the sequence of staking/flagging the perimeter of the project area, constructing of access roads, site grading and installation of grounded fence, assembly and installation of all project facilities, cleanup, and site reclamation of any temporary work areas.

e. Site preparation, surveying and staking

Site preparation consists of clearing, earthwork and grading as required to construct the facility and achieve finished site grades. Final grading design may require terraces to be up to a 10 meter elevation differential to allow for balanced earthwork and proper drainage.

f. Site preparation, vegetation removal and treatment

Pre-construction survey work will consist of staking/flagging ROW and site area boundaries, work areas (permanent and short term), cut and fill staking, access and roads, transmission structure centers, foundation structure staking, and desert tortoise/

endangered plants offsets. Staking/flagging will be maintained until final cleanup or reclamation.
Initial construction activities will include site clearing and grubbing to clear the site of vegetation and debris. Rough site grading, excavation and backfilling will be performed using heavy duty earth moving equipment. The balancing of cut-and-fill quantities will be accumulated from within the plant site. Embankments will be required around a portion of the site periphery to protect the plant from flooding during severe rainstorms.

g. Site clearing, grading and excavation

Rough site grading, excavation and backfilling will be performed using heavy duty earth moving equipment. The balancing of cut-and-fill quantities will be accumulated from within the plant site. Embankments and dikes will be required around a portion of the site periphery to protect the plant from flooding during severe rain storms. Upon completion of site preparation work, a permanent site security fence will be installed around the site perimeter. Temporary fencing will be provided to enclose material lay down and storage areas. Temporary parking areas will be created to accommodate the large construction force.

A preliminary grading plan is being prepared and will be presented separately to the BLM.

h. Gravel, aggregate, concrete needs and sources

Adequate aggregate surfacing will be provided around the power block as required for maintenance and access throughout the life of the Projects. All other areas will be left with the natural soil as the final surface.

All paved roads will utilize 24 foot wide, 2 ½ inch thick asphalt over a 6 inch aggregate base with 3 foot wide aggregate shoulders on the side. Aggregate surfaced roads will be 20 foot wide and 6 inches thick. Road width and turning radius will meet plant operations requirements and all local regulations, including local fire department access. Sun shades will be provided for a portion of all parking lots.

i. Aviation lighting (power block towers, transmission)

Consistent with FAA requirements, aviation lighting will be installed where mandated.

j. Site stabilization, protection, and reclamation practices

The expected project life is 30 years. Given the unique and extreme levels of solar radiation at this site, it is highly plausible that new and improved solar power generating technology will be deployed at the site to continue clean and renewable power generation. However, should the site be removed from power generation service, the site will be restored based on the desired subsequent use. As necessary, any contaminated soils will be fully remediated. All equipment, buildings, and foundations will be removed from the site. If the site is not planned for industrial, commercial or residential development, the site will be fully restored to its natural state.

Consistent with BLM requirements, a detailed decommissioning plan will be developed in a manner that both protects public health and safety and is environmentally acceptable.

3. Related Facilities and Systems

a. Transmission System Interconnect

i. Existing and proposed transmission system

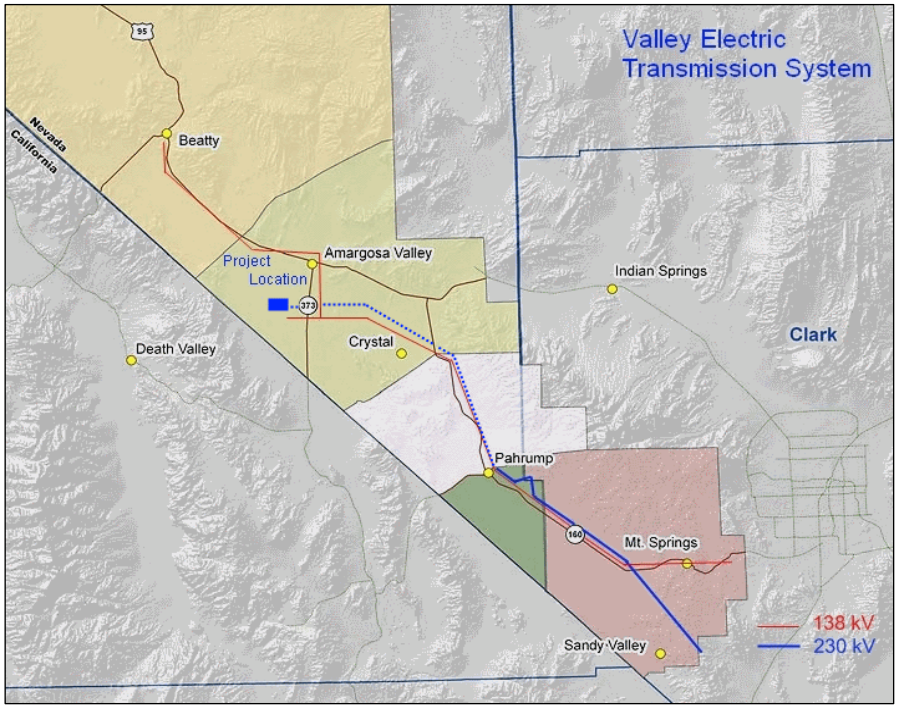


Figure 19: Transmission Map

The Valley Electric transmission system in the site vicinity is currently rated at 138 kV.

Valley Electric is studying the construction of a new 230 kV transmission line from the Valley substation to the proposed Johnnie substation, a new proposed facility to be located near Johnnie, Nevada. From the Johnnie substation a new 230 kV transmission line will connect to the existing 230 kV substation at Pahrump.

A new 230 kV line would be built from the substation at the Project site to either the Valley substation or another point of interconnection as established in the interconnection study. The 230-kV double-circuit line would likely be constructed on wooden, H-frame structures spaced 300-400 ft apart. The wooden pole structures are expected to be 85 feet above ground level. Conductor spacing would be about 15 feet. The power line would require a 50 foot wide right of-way.

ii. Ancillary facilities and substations

The Project facilities will include a 230 kV substation for transmitting the Projects' energy to the Valley electric system. The specific design of this substation will be defined when transmission studies are completed.

iii. Status of Power Purchase Agreements

Pursuant to confidentiality restrictions, Solar Millennium is not able to disclose the status of any power purchase agreement negotiations.

iv. Status of Interconnect Agreement

Solar Millennium has submitted an interconnection request for these projects, and the feasibility study is underway. Solar Millennium expects to receive a complete facilities study with final information regarding the routing of the gen tie line and interconnection design in mid-2009.

v. General design and construction standards

Plant construction will meet all applicable local, county, state and federal standards, including OSHA standards.

b. Gas Supply Systems

i. Backup natural gas generation requirements

The electric output of the plant will be supplied entirely with solar energy. No electricity is generated by the use of fossil fuel in this plant complex. A small gas-fired heat transfer fluid (HTF) heater is used for infrequent freeze protection of the HTF in the solar field. Gas for this purpose is supplied by truck.

ii. Pipeline routing considerations and construction standards

Pipeline use is not currently planned.

iii. Metering stations

Pipeline use is not currently planned, so metering stations are not planned.

c. Other Related Systems

Access Roads

Site access is from Farm Road, just off Rte 373. The locations of the principal site entry gates for both the construction and the commercial operating period will be evaluated in consultation with BLM, NDOT, and Nye County to ensure access and egress from the project site and power plants does not have adverse impacts on wildlife or traffic flow.

Where major temporary or permanent access points are implemented, roadbeds will be expanded and improved as appropriate to ensure public safety, maintain adequate traffic flow, and minimize dust and noise.

Access roads will have a travel service width of approximately 20 feet.

Access along the transmission line ROW would include using existing improved roads, using existing roads that require improvement, and building new roads. Permanent new roads would be graded to a travel service width of approximately 14 feet.

Water Pipelines

If available, cooling water for the plants is expected to be sourced from private water rights holders. Detailed routing and design of the water make-up and delivery system have yet to be completed. A twelve inch pipe would be sufficient to deliver the required quantities of water. Existing water line right-of-ways will be utilized wherever practical and available. However, this option is in the early stages of investigation and neither the definitive use of wet cooling, nor a pipeline route has been established.

i. Communications system requirements (microwave, fiber optics, hard wire, wireless) during construction and operations

Communications system requirements will be established during advanced project engineering.

4. Operations and Maintenance

a. Operation and facility maintenance needs

Solar Millennium will establish an Operations and Maintenance Service Company to operate and maintain the plants. Personnel for the O&M Services Company will be made up of staff that will be intimately involved in plant commissioning and acceptance testing. Solar Millennium is in the process of establishing a similar O&M Services Company in southern Spain to serve the AndaSol Unit 1 and 2 power projects.

The solar field is characterized by thousands of individual parts in modular solar collector assemblies. Management of O&M requires appropriate tracking tools and a dedicated staff. Such tools have been refined and optimized by Solar Millennium over the past three years as part of our test loop operation at Kramer Junction.

Management and supervision of the plant will be centered within the solar field maintenance organization. Skilled personnel will be assigned to conduct expedient maintenance and mirror washing. The primary responsibility of "field operators" is to monitor, in considerable detail, the condition and repair needs of the solar fields.

b. Maintenance activities, including mirror washing and road maintenance

c. Operations workforce and equipment

The O&M workforce is comprised of approximately 70-100 people. Equipment includes water trucks for cleaning mirrors and standard pickup trucks.

5. Environmental Considerations

The source of the information supplied below is a critical issues analysis prepared by CH2MHill for Solar Millennium in October, 2008.

a. General description of site characteristics and potential environmental issues (existing information)

Wildlife Resources. Based on an initial review of the Las Vegas District Management Plan and Record of Decision (Las Vegas RMP), the project site is not located in any wildlife management or conservation areas. The area is considered to be low quality habitat for the endangered desert tortoise. Further consultation and investigation with BLM, FWS and outside wildlife specialists will be undertaken to determine the nature of survey and any ultimate mitigation requirements.

Botanical Resources. Vegetation Mojave Creosote Bush Scrub (MCBS) (Holland, 1986) is the only vegetation type observed within the Site. MCBS can be divided into two basic subtypes on the Site. One subtype is dominated by species typical of creosote bush scrub habitats, and the second subtype supports saltbush scrub species that are characteristic of alkaline soil. The majority of the Site is dominated by creosote bush species (*Larrea tridentata*) and white bursage (*Ambrosia dumosa*) (Figure 3). The southwest portion of the Site is dominated by creosote bush and saltbush scrub species, including allscale (*Atriplex polycarpa*) and shadscale (*Atriplex confertifolia).* In many areas, the transition between these two subtypes is gradual, and they frequently intergrade. **Requirements:** Per the BLM and Nevada Revised Statutes (N.R.S.) 527.060-.120 and Nevada Administrative Code Chapter 527, surveys to quantify location of cacti species for salvage purposes would be required. BLM will likely require noxious weeds to be mapped onsite as well.

i. Special or sensitive species and habitats

No federally listed plant species are known to occur within the Site or are expected to occur because suitable habitat for federally listed plant species is either not present or

the Site is outside of their known range. Three other non-federally listed special-status plants have potential to occur on the Site: white bearpoppy *(Arctomecon merriamii*), Reveal's buckwheat (*Eriogonum contiguum*), and Death Valley beardtongue (*Penstemon fruticiformis* ssp. *amargosae*).

Anticipated survey requirements: A rare plant survey following agency-accepted protocols would be needed to determine presence or absence of any potentially occurring special-status plant species. Typically, this would be required from approximately March through April, but timing varies from year to year depending on when precipitation and the onset of warm temperatures occur. The survey methodology and survey team will need to be reviewed and approved by the BLM botanist prior to conducting the survey. BLM- and NNPS-listed plants are protected under most national Environmental Policy Act (NEPA) actions, and avoidance, minimization of impact, or compensatory mitigation would be required should any of these species be identified and impacted.

The only federally listed wildlife species with potential to occur within the Site is the Mojave desert tortoise (*Gopherus agassizii*), a federally threatened species. However, tortoise density would be expected to be low based on the following: (1) tortoises or sign (such as shells, bones, scat or active burrows) were not observed during the reconnaissance-level survey, (2) low-quality habitat is present (such as low shrub and annual diversity for forage), and (3) no known NNHP occurrences of tortoise are recorded in this area.

Avian nesting potential is low to moderate onsite. Burrowing owls, a BLM sensitive species and a Nevada animal species considered to be "at risk" in all counties in Nevada and is tracked by the NNHP could utilize burrows made by canids, squirrels, or other species.

Habitat for burrowing owls is present throughout the Site. LeConte's thrasher and Bendire's thrasher are all special-status bird species that have potential to occur onsite. Potential nesting sites would likely be confined to areas with larger creosote bushes. In addition, raptors potentially could also nest onsite. Active bird nests and their eggs are protected under the Migratory Bird Treaty Act (MBTA) during the nesting season.

Anticipated survey requirements: Surveys for the Mojave desert tortoise will be required as determined by USFWS and BLM. Surveys for tortoise would likely occur during March through May. Consultation with the USFWS would be required. If presence is determined, compensatory mitigation and special permits or authorizations will be required. Nesting bird species would be protected during the nesting season,

typically February to July. Should nesting birds occur, ground disturbance and vegetation removal may be restricted during this period.

ii. Special land use designations

The Project site is not subject to any special land use designations.

iii. Cultural and historic resource sites and values

Based on preliminary screening of available data, it appears that this project site does not have significant cultural resources. We will consult with BLM staff to determine the extent of survey requirements for the project site.

A prehistoric and historic records and literature search was conducted by CH2M HILL on November 20, 2008. A complete search of the project area was conducted through the Nevada Cultural Resource Information System (NVCRIS), an online database of all cultural resources and previous studies in the State of Nevada. Additionally, the National Register Information System (NRIS) was consulted for Nye County, Nevada to determine if any sites are located within the project area that are currently listed on the National Register of Historic Places (NRHP). Additionally, the following maps were reviewed: the 1883 *Map of Nevada* by H.H. Hardesty, the 1885 *Railroad and County Map* by George F. Cram, the 1906 *Amargosa Region of Nevada and California* by the U.S. Geological Survey, the 1914 *State of Nevada* by General Land Office, the 1937 *Official Sears Road Map of Nevada and Utah*, the 1939 *State of Nevada* by the U.S. Geological Survey, and the 1984 *South of Amargosa Valley* 7.5' USGS topographic quadrangle map.

The literature search revealed that the majority of the project area has not been surveyed for cultural resources. A total of seven previous studies have been conducted within the project area totaling less than ten percent of the entire project area.

Only one cultural resource was found during these studies, site NV-NY-1643. This is a prehistoric resource consisting of two isolated artifacts situated approximately 60 m apart, an obsidian flake and a rhyolite core. One road was observed running through the northeast portion of the project area on the 1906 Amargosa Region of Nevada and California map and Miller Well No. 1 is depicted within the project area on the 1914 General Land Office State of Nevada map.

The historic road pictured on the 1906 is the historic Las Vegas to Bullfrog Road. It is

recorded elsewhere in Nye County as Site NV-NY-7810 as a moderately intact segment of the historic Las Vegas to Bullfrog Road which was constructed between 1904 and 1908. It is noted to be a worn down linear feature in the Amargosa Valley trending towards the northwest with 56 associated artifacts located along its route. The portions which are recorded are noted to be eligible for listing on the NRHP under Criterion A due to the good degree of integrity of the road and associated debris and the road's association with the settling of southern Nevada.

Given the lack of permanent water sources or other potentially sensitive environmental conditions, the relatively flat terrain, and the general lack of known significant cultural resources, the presence of any significant cultural resources constraints appears unlikely within the study area. This said, a significant portion of the project site has not been subject to a pedestrian inventory and resources could potentially be present in these unsurveyed areas. Also, both prehistoric and historic resources are known to occur within the general area and it is therefore recommended that a pedestrian inventory be performed to more accurately determine potential impacts. Based on the literature accessed from the NVCRIS, in general, cultural resources are not considered to be a "fatal flaw" for this project in this location, and are unlikely to represent a substantive constraint during project implementation.

Our approach to conducting the cultural resource investigation for the project areas is predicated on obtaining sufficient and current cultural resources data to provide for an accurate analysis of potential project impacts to cultural resources consistent with the requirements of the National Environmental Policy Act, Archeological Resources Protection Act, Native American Graves Protection and Repatriation Act, Sections 106 and 101 (d)(6)(B) of the National Historic Preservation Act. Our approach includes conducting pedestrian survey coverage of the entire site and associated linear corridor facilities, to include an archaeological survey area extending no less than 200 feet around the project site (to include all substations and staging areas) and to extend no less than 50 feet on either side of the right-of-way for all linear facility routes. Based on the location of the project sites, in generally open desert areas, no historic architecture surveys are proposed. Our approach also includes assistance to the BLM for all consultations with local tribes, including government recognized tribes and non-government recognized tribes for the purposes of identifying sacred sites, traditional cultural properties, and cultural landscapes that cannot be determined through a records search or pedestrian survey coverage.

iv. Native American tribal concerns

As discussed above, the cultural resource investigation for the site will include assistance to the BLM as needed in conducting consultation with local tribes, including government recognized tribes and non-government recognized tribes for the purposes of identifying sacred sites, traditional cultural properties, and cultural landscapes.

v. Recreation and OHV conflicts

The project development effort will ensure compatibility with area recreation activities, via the use of modified lighting, etc. Any OHV routes running across the site area will be mapped as part of the EIS process.

vi. Other environmental considerations

Waters of the U.S. Several ephemeral drainages flow in a south to southwest direction across the Site. The largest drainage is Fortymile Wash, which is a tributary to the Amargosa River, located south of the Site (Figure 1). Fortymile Wash is a broad network of interconnected drainages extending over approximately 4 miles across the Site. The Site is located approximately 5 miles south of the critical 100-year floodplain (FEMA, 2008) but floodplain permits from the County and compliance with Executive Order (EO) 11990, Protection of Wetlands, and EO 11988, Floodplain Management will be required as part of the NEPA process (Peterson, 2008, personal communication).

Requirements. A wetland and waters of the U.S. delineation following the USACE three-parameter approach and arid region guidance will be needed to determine if the drainages onsite are subject to USACE jurisdiction. Section 401 Certification or Waiver from the state may also be required.

b. Mitigation measures proposed by applicant and included in POD

If sensitive biological species are identified at the Project site, the potential for “take” during construction and operation exists. Mitigation in the form of consultation, compensation, and memorandums of understanding with the Nevada Department of Wildlife as well as the United States Fish and Wildlife Service will likely be required.

An archeological study will be required to determine if any cultural resources are located within the Project area. If the results of an archeological study indicate the presence of cultural resources, mitigation requiring resource removal or altering of the Projects’ boundaries to prevent disturbance may be required.

6. Maps and Drawings

a. Maps with footprint of solar facility (7.5 min topographic maps or equivalent to include references to Public Land Survey system)

Please see Figure 9 on page 18.

b. Initial design drawings of solar facility layout and installation, thermal power conversion facilities, electrical facilities and ancillary facilities

Please see Figures 10 and 11 on pages 20 and 21.

c. Initial site grading plan

This is being prepared under separate cover for presentation to the BLM.

d. Maps with transmission facilities, substations, distribution, communications

Please see page 56.

e. Access and transportation maps

Please see page 53.

Exhibit 1: BLM ROWs Shown on Master Plat Map

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
GEOGRAPHIC REPORT WITH LAND
SORTED BY SERIAL NUMBER

Serial Number: **NVCC 0021488**
Total Case Acres: **1654.855**

Casetype	Case Disp	MER	TWP	RNG	SEC	SUR TYPE	SUR NR	SUF	SUBDIVISION	ACT PEND
286203	CLOSED	21	0160S	0480E	003	A			E2SE;	
					011	A			S2SE;	
					012	A			S2S2;	
					013	A			N2N2;	
					014	A			N2NWNE,N2N2NW;	

Serial Number: **NVN 022191**
Total Case Acres: **320.000**

Casetype	Case Disp	MER	TWP	RNG	SEC	SUR TYPE	SUR NR	SUF	SUBDIVISION	ACT PEND
252000	CLOSED	21	0160S	0480E	009	A			N2;	

Serial Number: **NVN 022192**
Total Case Acres: **320.000**

Casetype	Case Disp	MER	TWP	RNG	SEC	SUR TYPE	SUR NR	SUF	SUBDIVISION	ACT PEND
252000	CLOSED	21	0160S	0480E	009	A			N2;	

Serial Number: **NVN 022409**
Total Case Acres: **320.000**

Casetype	Case Disp	MER	TWP	RNG	SEC	SUR TYPE	SUR NR	SUF	SUBDIVISION	ACT PEND
252000	CLOSED	21	0160S	0480E	005	A			E2;	

Serial Number: **NVN 022973**
Total Case Acres: **320.000**

Casetype	Case Disp	MER	TWP	RNG	SEC	SUR TYPE	SUR NR	SUF	SUBDIVISION	ACT PEND
252000	CLOSED	21	0160S	0480E	013	A			W2;	

Serial Number: **NVN 023207**
Total Case Acres: **320.000**

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
GEOGRAPHIC REPORT WITH LAND
SORTED BY SERIAL NUMBER

Serial Number: **NVN 023207**
Total Case Acres: **320.000**

Casetype	Case Disp	MER	TWP	RNG	SEC	SUR TYPE	SUR NR	SUF	SUBDIVISION	ACT PEND
252000	CLOSED	21	0160S	0480E	016	A			NW,SWNE,N2SE,SESE;	

Serial Number: **NVN 023208**
Total Case Acres: **320.000**

Casetype	Case Disp	MER	TWP	RNG	SEC	SUR TYPE	SUR NR	SUF	SUBDIVISION	ACT PEND
252000	CLOSED	21	0160S	0480E	006	L			1-4;	

Serial Number: **NVN 035976**
Total Case Acres: **2040.000**

Casetype	Case Disp	MER	TWP	RNG	SEC	SUR TYPE	SUR NR	SUF	SUBDIVISION	ACT PEND
272011	AUTHORIZED	21	0160S	0480E	025	A			W2;	
					026	A			SE;	
					036	A			W2NE,SENE,NW;	
					036	L			1-8;	

Serial Number: **NVN 048876**
Total Case Acres: **2.420**

Casetype	Case Disp	MER	TWP	RNG	SEC	SUR TYPE	SUR NR	SUF	SUBDIVISION	ACT PEND
281001	AUTHORIZED	21	0160S	0480E	027	A			S2SE;	

Serial Number: **NVN 051729**
Total Case Acres: **2023.100**

Casetype	Case Disp	MER	TWP	RNG	SEC	SUR TYPE	SUR NR	SUF	SUBDIVISION	ACT PEND
311121	CLOSED	21	0160S	0480E	020	A			N2,N2SW,SESW,SE;	
					020	L			1;	
					021	9			ENTIRE SECTION	
					022	9			ENTIRE SECTION	
					029	A			N2NE,SENE;	
					029	L			1,2,3;	

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
GEOGRAPHIC REPORT WITH LAND
SORTED BY SERIAL NUMBER

Serial Number: **NVN 051730**
Total Case Acres: **1879.570**

Casetype	Case Disp	MER	TWP	RNG	SEC	SUR TYPE	SUR NR	SUF	SUBDIVISION	ACT PEND
311121	CLOSED	21	0160S	0480E	027	A			N2N2,SWNE,SWNW,NWSE,S2SE;	
					028	A			N2,N2SW,SESW,SE;	
					028	L			1;	
					033	A			N2NE,SENE;	
					033	L			1,2,3;	
					034	A			N2;	
					034	L			1-11;	

Serial Number: **NVN 053336**
Total Case Acres: **11.000**

Casetype	Case Disp	MER	TWP	RNG	SEC	SUR TYPE	SUR NR	SUF	SUBDIVISION	ACT PEND
286007	CLOSED	21	0160S	0480E	013	A			SWNW;	

Serial Number: **NVN 053354**
Total Case Acres: **1.818**

Casetype	Case Disp	MER	TWP	RNG	SEC	SUR TYPE	SUR NR	SUF	SUBDIVISION	ACT PEND
281001	AUTHORIZED	21	0160S	0480E	008	A			E2E2E2SW;	

Serial Number: **NVN 056884**
Total Case Acres: **640.000**

Casetype	Case Disp	MER	TWP	RNG	SEC	SUR TYPE	SUR NR	SUF	SUBDIVISION	ACT PEND
272011	CLOSED	21	0160S	0480E	025	A			E2;	

Serial Number: **NVN 071806**
Total Case Acres: **0.000**

Casetype	Case Disp	MER	TWP	RNG	SEC	SUR TYPE	SUR NR	SUF	SUBDIVISION	ACT PEND
380913	CLOSED	21	0160S	0480E	028	9			ENTIRE SECTION	

Serial Number: **NVN 072147**
Total Case Acres: **0.400**

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
GEOGRAPHIC REPORT WITH LAND
SORTED BY SERIAL NUMBER

Serial Number: **NVN 072147**
Total Case Acres: **0.400**

Casetype	Case Disp	MER	TWP	RNG	SEC	SUR TYPE	SUR NR	SUF	SUBDIVISION	ACT PEND
380913	CLOSED	21	0160S	0480E	021	9			ENTIRE SECTION	

Serial Number: **NVN 073706**
Total Case Acres: **797.740**

Casetype	Case Disp	MER	TWP	RNG	SEC	SUR TYPE	SUR NR	SUF	SUBDIVISION	ACT PEND
286203	AUTHORIZED	21	0160S	0480E	003	A			E2SE;	
					011	A			S2SE;	
					012	A			S2S2;	
					013	A			N2N2;	
					014	A			NWNE,N2NW;	

Serial Number: **NVN 074064**
Total Case Acres: **1.000**

Casetype	Case Disp	MER	TWP	RNG	SEC	SUR TYPE	SUR NR	SUF	SUBDIVISION	ACT PEND
281001	CLOSED	21	0160S	0480E	013	B			W2W2W2;	
					035	L			9;	

Serial Number: **NVN 074535**
Total Case Acres: **0.786**

Casetype	Case Disp	MER	TWP	RNG	SEC	SUR TYPE	SUR NR	SUF	SUBDIVISION	ACT PEND
285003	AUTHORIZED	21	0160S	0480E	035	L			9;	

Serial Number: **NVN 07453501**
Total Case Acres: **0.786**

Casetype	Case Disp	MER	TWP	RNG	SEC	SUR TYPE	SUR NR	SUF	SUBDIVISION	ACT PEND
280004	CLOSED	21	0160S	0480E	035	L			9;	

Serial Number: **NVN 084359**
Total Case Acres: **7550.000**

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
GEOGRAPHIC REPORT WITH LAND
SORTED BY SERIAL NUMBER

Serial Number: **NVN 084359**
Total Case Acres: **7550.000**

Casetype	Case Disp	MER	TWP	RNG	SEC	SUR TYPE	SUR NR	SUF	SUBDIVISION	ACT PEND
285003	PENDING	21	0160S	0480E	001	9			ENTIRE SECTION	Y
					002	A			E2;	Y
					011	A			E2;	Y
					012	9			ENTIRE SECTION	Y
					013	A			W2,NWSE,SWNE,N2NE;	Y
					014	A			W2,W2NE;	Y

Serial Number: **NVN 084468**
Total Case Acres: **3200.000**

Casetype	Case Disp	MER	TWP	RNG	SEC	SUR TYPE	SUR NR	SUF	SUBDIVISION	ACT PEND
285003	CLOSED	21	0160S	0480E	001	9			ENTIRE SECTION	Y
					002	A			E2;	Y
					011	A			E2;	Y
					012	9			ENTIRE SECTION	Y

Serial Number: **NVN 085654**
Total Case Acres: **3597.000**

Casetype	Case Disp	MER	TWP	RNG	SEC	SUR TYPE	SUR NR	SUF	SUBDIVISION	ACT PEND
285003	PENDING	21	0160S	0480E	001	9			ENTIRE SECTION	Y
					002	A			E2;	Y
					011	A			E2;	Y
					012	9			ENTIRE SECTION	Y

Serial Number: **NVN 0058190**
Total Case Acres: **50.606**

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
GEOGRAPHIC REPORT WITH LAND
SORTED BY SERIAL NUMBER

Serial Number: **NVN 0058190**
Total Case Acres: **50.606**

Casetype	Case Disp	MER	TWP	RNG	SEC	SUR TYPE	SUR NR	SUF	SUBDIVISION	ACT PEND
285001	AUTHORIZED	21	0160S	0480E	008	B			S2S2SE;	Y
					009	B			S2S2S2;	Y
					010	B			S2S2S2;	Y
					011	B		01	S2S2SW;	Y
					011	B		02	S2S2SE;	Y
					012	B			S2S2S2;	Y
					014	B			E2E2E2;	Y
					023	B			E2E2E2;	Y

Serial Number: **NVN 0066289**
Total Case Acres: **377.900**

Casetype	Case Disp	MER	TWP	RNG	SEC	SUR TYPE	SUR NR	SUF	SUBDIVISION	ACT PEND
285003	AUTHORIZED	21	0160S	0480E	001	9			ENTIRE SECTION	Y
					002	9			ENTIRE SECTION	Y
					003	9			ENTIRE SECTION	Y
					005	9			ENTIRE SECTION	Y
					006	9			ENTIRE SECTION	Y
					011	9			ENTIRE SECTION	Y
					013	9			ENTIRE SECTION	Y
					015	9			ENTIRE SECTION	Y
					016	9			ENTIRE SECTION	Y
					017	9			ENTIRE SECTION	Y
					018	9			ENTIRE SECTION	Y
					019	9			ENTIRE SECTION	Y
					020	9			ENTIRE SECTION	Y

TOWNSHIP 16 SOUTH RANGE 48 EAST OF THE MOUNT DIABLO MERIDIAN, NEVADA

SECTION OR TRACT	SUBDIVISION																LOTS	OTHER DESCRIPTION	ACRES	KIND OF ENTRY -OR- PURPOSE OF ORDER	SERIAL FILE -OR- ORDER NUMBER	DATE OF ACTION	DATE POSTED	— REMARKS — E. G. DATE CLOSED, TERMINATED, REJECTED OR RESCINDED
	NE 1/4				NW 1/4				SW 1/4				SE 1/4											
	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE								
	FOR ORDERS EFFECTING DISPOSAL OR USE OF UNIDENTIFIED LANDS WITHDRAWN FOR CLASSIFICATION, MINERALS, WATER, AND/OR OTHER PUBLIC PURPOSES, REFER TO INDEX OF MISCELLANEOUS DOCUMENTS																							
																		Subdiv Und; 16S 52E		R/W Tonopah & Tidewater RR	CC 0641	9/25/1908		Rel 6/14/1926
4																		Subdiv Und		R/W Tonopah & Tidewater RR				
																				Sta Grounds	CC 09811	2/6/1917		
2																		All						
11																		All						
14																		All						
23																		All	2560.00	Pittman Per	CC 013107	1/18/1922		Canc 1/29/1923
5																		All						
6																		All						
8																		All						
9																		All	2560.00	Pittman Per	CC 013487	1/24/1922		Canc 6/11/1925
4																		All; 15S 48E	640.00	Pittman Per	CC 013492	1/24/1922		Canc 4/4/1923
3																		All						
10																		All						
15																		All						
16																		All	2560.00	Pittman Per	CC 013707	1/24/1922		Canc 1/7/1926
26																		All	640.00	Pittman Pat	1004439	6/27/1927		
25																		All	640.00	Pittman Pat	1005737	7/29/1927		
36	X	X	X	X	X	X	X	X									See Rmks		640.00	Pittman Pat	1011550	2/1/1928		Lots 1, 2, 3, 4, 5, 6, 7, 8
2																		All						
11																		All						
14																		All						
23																		All	2560.00	Pittman Per	CC 017648	2/14/1931		Canc 4/17/1933
4																		All						
8																		All						
9																		All						
16																		All	2560.00	Pittman Per	CC 017649	5/2/1931		Canc 5/2/1936
3																		All						
10																		All						
15																		All						
22																		All	2560.00	Pittman Per	CC 017753	1/19/1932		Canc 10/3/1932
15					X	X	X	X	X	X	X	X							320.00	DLE	Nev 08305	1/4/1954		Canc 4/1/1955
14					X	X	X	X	X	X	X	X							320.00	DLE	Nev 08307	1/4/1954		Rel 9/5/1958
27					X			X	X	X	X	X							240.00	DLE	Nev 09106	1/4/1954		Canc 4/1/1955
35	X	X	X	X													1, 8		240.00	DLE	Nev 09107	1/4/1954		Canc 4/1/1955
34						X													40.00	DLE	Nev 09108	1/4/1954		Canc 4/1/1955
27	X	X	X											X	X	X			240.00	DLE	Nev 09110	1/4/1954		Canc 5/23/1961
14		X																	40.00	DLE	Nev 025664	11/13/1956		Canc 2/26/1963
4									X	X	X	X	X	X	X	X			320.00	DLE	Nev 026351	11/14/1956		See Pat 1232774 7/31/1963
2					X	X	X	X	X	X	X	X							320.00	DLE	Nev 032797	11/15/1956		Canc 4/10/1957
2	X	X	X	X									X	X	X	X			320.00	DLE	Nev 032799	11/15/1956		Canc 5/13/1958
8					X	X	X	X	X	X	X	X							320.00	DLE	Nev 034036	11/20/1956		Partially Relinq; See Pat 1234043 dated 11/5/1963
9	X	X	X	X	X	X	X	X											320.00	DLE	Nev 030376	11/21/1956	4/22/1964 9:00 am	Canc 4/17/1964
3									X	X	X	X	X	X	X	X			320.00	DLE	Nev 030377	11/21/1956		Canc 5/14/1962
11					X	X	X	X	X	X	X	X							320.00	Dle	Nev 030856	11/21/1956		Rel 1/19/1959
3	X	X	X	X	X	X	X	X											320.00	DLE	Nev 032573	11/21/1956		Rel 12/10/1958
5	X	X	X	X									X	X	X	X			320.00	DLE	Nev 032653	11/21/1956	4/6/1965 8:00 am	Canc 4/5/1965
4	X	X	X	X	X	X	X	X											320.00	DLE	Nev 032572	11/23/1956		Canc 10/10/1963
7					X	X	X	X											158.36	DLE	Nev 039028	11/23/1956		Canc 3/4/1960

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TOWNSHIP 16 SOUTH RANGE 49 EAST OF THE MOUNT DIABLO MERIDIAN, NEVADA

SECTION OR TRACT	SUBDIVISION																LOTS	OTHER DESCRIPTION	ACRES	KIND OF ENTRY —OR— PURPOSE OF ORDER	SERIAL FILE —OR— ORDER NUMBER	DATE OF ACTION	DATE POSTED	— REMARKS — E. G. DATE CLOSED, TERMINATED, REJECTED OR RESCINDED
	NE ¼				NW ¼				SW ¼				SE ¼											
	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE								
	FOR ORDERS EFFECTING DISPOSAL OR USE OF UNIDENTIFIED LANDS WITHDRAWN FOR CLASSIFICATION, MINERALS, WATER, AND/OR OTHER PUBLIC PURPOSES, REFER TO INDEX OF MISCELLANEOUS DOCUMENTS																							
31																	9, 10, 11, 12	17S 49E, 17S 48E	105.56	Pittman Per	CC 011723	7/19/1920		Canc 7/29/1927
7																		All						
18																		All						
19																		All	1920.00	Pittman Per	CC 012078	11/5/1920		Canc 7/29/1927
8																		All						
17																		All						
20																		All						
29																		All	2560.00	Pittman Per	CC 013292	1/18/1922		Canc 1/29/1923
32																		All						
33																		All						
34																		All						
35																		All	2560.00	Pittman Per	CC 013293	1/18/1922		Canc 1/29/1923
3																		All	640.00					
4																		All; 17S 48E	640.00	Pittman Per	CC 013787	5/29/1923		Canc 9/26/1925
31	X	X	X	X	X	X	X	X									1 thru 8		640.00	Pittman Pat	1005736	7/29/1927		
30																		All	640.00	Pittman Pat	1005738	7/29/1927		
17																		All						
20																		All						
29																		All						
32																		All	2665.96	Pittman Per	CC 017650	2/14/1931		Canc 9/29/1932
1																								
12																								
13																								
23																								
24																								
26																								
35																		Subdiv Und; 15S 49E		R/W Hwy	CC 018323	8/6/1934		
1												X								R/W Mat Site	CC 018386	12/3/1934		
26				X														E½SW¼NE¼		R/W Mat Site	CC 018387	12/3/1934		
18			X	X			X	X											160.00	DLE	Nev 08293	1/4/1954		Canc 4/1/1955
18									X	X	X	X	X	X		X			280.00	DLE	Nev 08294	1/4/1954		Canc 4/1/1955
15	X	X	X	X	X	X	X	X											320.00	DLE	Nev 08309	1/4/1954		Rel 3/7/1955
15									X	X	X	X	X	X	X	X			320.00	DLE	Nev 08310	1/4/1954		Rel 3/7/1955
14									X	X	X	X	X	X	X	X			320.00	DLE	Nev 08311	1/4/1954		Rel 3/7/1955
14	X	X	X	X	X	X	X	X											320.00	DLE	Nev 08312	1/4/1954		Rel 3/7/1955
23	X	X	X	X	X	X	X	X											320.00	DLE	Nev 08406	1/4/1954		Rel 3/7/1955
22	X	X	X	X	X	X	X	X											320.00	DLE	Nev 08407	1/4/1954		Rel 3/7/1955
32			X														1, 2, 7, 8, 9, 10		253.09	DLE	Nev 08931	1/4/1954		Canc 4/1/1955
33																	9, 10, 11, 12							
34																	9, 10, 11, 12							
35																	9, 10, 11, 12		332.28	DLE	Nev 08932	1/4/1954		Canc 4/1/1955
34	X	X	X	X				X											200.00	DLE	Nev 08936	1/4/1954		Rel 2/19/1954
35	X	X	X	X	X	X	X	X											320.00	DLE	Nev 08937	1/4/1954		Rel 2/19/1954
33																	1 thru 8		320.00	DLE	Nev 08938	1/4/1954		Rel 2/19/1954
34																	1 thru 8		320.00	DLE	Nev 08939	1/4/1954		Rel 2/19/1954
35																	1 thru 8		320.00	DLE	Nev 08997	1/4/1954		Rel 2/10/1954
33	X	X	X	X	X	X	X	X											320.00	DLE	Nev 08998	1/4/1954		Rel 2/10/1954
32								X									3, 5, 6, 11, 12		212.87	DLE	Nev 09001	1/4/1954		Canc 7/14/1961

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Exhibit 2: Material Safety Data Sheets – Principal Chemicals Used on Site

MATERIAL SAFETY DATA SHEET

Section I MATERIAL SAFETY DATA SHEET

Supplier's Name_____ Emergency Phone Number_____

Address:_____

Chemical Name: LIQUEFIED PETROLEUM GAS or PROPANE Formula: C_3H_8

CAS Registry No.: 74-98-6 Chemical Family: Hydrocarbon

WARNING: Danger! Extremely flammable. Compressed Gas Asphyxiant in high concentrations. Contact with liquid causes burns similar to frost bite. OSHA permissible exposure limit (PEL) 1000 ppm for an 8-hour workday.

Appearance and Odor: Vapor and liquid are colorless. Product contains an odorant (unpleasant odor).

Section II HAZARDOUS INGREDIENTS

Hazardous Mixtures: Air with 2.15 to 9.60 percent propane

Section III PHYSICAL DATA

Boiling Point: -44 ºF

Specific Gravity (H_2O = 1): 0.51

Vapor Density (air = 1): 1.52

Solubility in Water: Slightly

Vapor Pressure (PSIG) at 100 ºF: 205

Percent, Volatile by Volume (%): 100

Evaporation rate: Gas at normal ambient temperatures

Section IV FIRE AND EXPLOSION HAZARD DATA

Flash Point: 156 ºF(CC)

Flammable Limits - LFL: 2.15 UFL: 9.60

Classification: Flammable Gas UN 1075

Extinguishing Media: Water spray-Class A-B-C or BC fire extinguisher.

Special Fire Fighting Procedures: Stop flow of gas. Use water to keep fire exposed containers cool. Use water spray to disperse unignited gas or vapor. If ignition has occurred and no water available, tank metal may weaken from overheating. Evacuate area. If gas has not ignited, LP-gas liquid or vapor may be dispersed by water spray or flooding.

Decomposition Products under Fire Conditions: Fumes, smoke, carbon monoxide, aldehydes and other decomposition products, in the case of incomplete combustion or when used as an engine fuel.

"EMPTY" Container Warning: "Empty" containers retain residue (liquid and/or vapor) and can be dangerous. DO NOT PRESSURIZE, CUT WELD, BRAZE, SOLDER, DRILL, GRIND OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS OR OTHER SOURCES OF IGNITION; THEY MAY EXPLODE AND CAUSE INJURY OR DEATH. Do not attempt to clean since residue is difficult to remove. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations.

Section V HEALTH HAZARD

OSHA P.E.L.: 1000 PPM ACGIH TLV: 1000 PPM Effects of Overexposure: Inhalation - concentrations can lead to symptoms ranging from dizziness to anesthesia and respiratory arrest. Eyes - moderate irritation. Emergency & First Aid procedures: Inhalation - remove to fresh air. Guard against self injury. Apply artificial respiration if breathing has stopped.

Section VI REACTIVITY DATA

Stable:__X __ Unstable:_____ Hazardous Decomposition Products: None_____
Incompatibility (materials to avoid): Mixing with oxygen or air, except at burner
Hazardous Polymerization: May occur_____ Will not occur___X ___

Section VII SPILL OR LEAK PROCEDURES

Steps to be taken in case material is released: Keep public away. Shut off supply of gas. Eliminate sources of ignition. Ventilate the area. Disperse with water spray. Contact between skin and these gases in liquid form can cause freezing of tissue causing injury similar to thermal burn.
Waste Disposal Method: Controlled burning. Contact supplier.

Section VIII SPECIAL PROTECTION INFORMATION

Respiratory Protection: Stay out of gas or vapor (because of fire hazard). Ventilation: Explosion-proof motors and keep sources of ignition at safe distances. Personal Protective Equipment and Apparel: Gloves resistant to the actions of LP-gases, goggles for protection against accidental release of pressurized products.

Section IX SPECIAL PRECAUTIONS

Precautions to be taken when handling and storing: Keep containers away from heat sources and store in upright position. Containers should not be dropped. Keep container valve closed when not in use. Other Precaution: Install protective caps and plug container service valve when not connected for use.

Section X TOXICOLOGICAL INFORMATION

OSHA Carcinogen Classification (29 CFR 1910) Not listed/applicable___X___
U.S. Department of Health (21 CFR 184.1655): Generally recognized as safe (GRAS) as a direct human food ingredient when used as a propellant, aerating agent and gas a as defined in Section 170.3(o)(25).

Section XI DOT LABELING INFORMATION (49 CFR 100-199)

Proper shipping name: Liquefied Petroleum Gas
Identification No.: UN 1075
Hazardous Classification: Flammable Gas
Label(s) Required: Flammable Gas

Section XII ISSUE INFORMATION

Issue Date:_____

This material safety data sheet and the information it contains is offered to you in good faith as accurate. This Supplier does not manufacture this product but is a supplier of the product independently manufactured by others. Much of the information contained in this data sheet was received from sources outside our Company. To the best of our knowledge this information is accurate, but this Supplier does not guarantee its accuracy or completeness. Health and safety precautions in this data sheet may not be adequate for all individuals and/or situations. It is user's obligation to evaluate and use this product safely, comply with all applicable laws and regulations and to assume the risks involved in the use of this product.

NO WARRANTY OR MERCHANT ABILITY, FITNESS FOR ANY PARTICULAR PURPOSES, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THIS INFORMATION, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE.

[**Home**][**Campora History**][**Residential Services/Safety Check**][**Commercial Industrial**]
[**Propane Sales**][**Material Safety Data Sheets**][**Send us email**]

PAN Pesticides Database - Pesticide Products

Product Name on Label: Slimicide mc-31

The EPA Registered Name for this product is: Ge betz slimicide c-31

This occurs when a single registered products is sold using many different names. For a complete list, see the Distributor Names list at the bottom of the page.

Note: See Working with the Information on this Page section below for important notes about this data.

Product ID	Identifying information, including U.S. EPA registration number, product registration status, formulation and warning label, as well as links to sources of product labels and MSDS information.
Toxicity	Summary of the toxicity properties of each active ingredient and the percent of each active ingredient in the product.
Uses	Approved uses for the product by general use type, pest, and crop or location.
Registration	Product registration history, including initial date registered, date cancelled (if applicable), and date registration was transferred (if applicable).
Company	Name, address, and identifying number of the company that registered the product. Name and address of the agent, if applicable.
Distributor Names	Complete list of names under which this product is sold. Often a company will register a single product and then sell the same product under many different brand names. The 'Distributor Name' list is a complete list of these names.

Product Identification for Ge betz slimicide c-31

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Basic Identification Information About This Product

MSDS and Product Label	Select Source
U.S. EPA Product Reg No	3876-121
Product Registration Status	Active
Formulation	Ready-to-use solution
Acute Hazard Warning Label	1 Danger
Restricted Use Product	No
PAN Bad Actor Product:	Yes
No. of names this product is sold under	2 (See bottom of page for complete list of products)

Toxicity for Ge betz slimicide c-31

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Summary Toxicity Information for the Active Ingredients in this Product

For detailed chemical information click on the chemical names below

Active Ingredients Chemical Name	Percent	PAN Bad Actor Chemical [1]	Acute Toxicity [2]	Carcinogen	Cholinesterase Inhibitor	Developmental or Reproductive Toxin	Endocrine Disruptor	Acute Aquatic Toxicity
Dodecyl guanidine hydrochloride	10.0 %	Not Listed	?	?	No	?	?	Not Acutely Toxic
Methylene bis(thiocyanate)	5.00 %	☠	☠	☠	No	?	?	☠

☠ Indicates high toxicity in the given toxicological category.

? Indicates no available weight-of-the-evidence assessment. For additional information on toxicity from scientific journals or registration documents, see the "Additional Resources for Toxicity " section of the chemical detail page for each active ingredient.

1. **PAN Bad Actors** are chemicals that are one or more of the following: highly acutely toxic, cholinesterase inhibitor, known/probable carcinogen, known groundwater pollutant or known reproductive or developmental toxicant. NOTE! Because there are no authoritative lists of Endocrine Disrupting (ED) chemicals, EDs are not yet considered PAN Bad Actor chemicals.

2. The acute toxicity reported here is for the pure active ingredient only and may not reflect the acute toxicity of individual pesticide products. The acute toxicity of this product can be found in the Product ID section of this page, the Acute Hazard Warning Label.

Other Ingredients in this Product

By U.S. law, only active ingredients (AIs) are reported. In addition to active ingredients, pesticide products may contain one or more "inert" ingredients. Many "inert" ingredients in current use have known adverse human and environmental effects.

U.S. EPA statement on inerts U.S. EPA list of inerts NCAP Inerts Report (pdf)

Registered Uses in the U.S. for Ge betz slimicide c-31

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Uses

Algaecide , Microbicide/microbistat

Pests

Slime-forming bacteria , Slime-forming fungi (paper mills/water systems) , Algae

Crops and Locations

Brewery pasteurizer water , Air washer water , Cooling tower water , Evaporative condenser water , Sewage systems , Sewage settling ponds (lagoons) , Heat exchanger water , Industrial water (unspecified)

U.S. Product Registration History for Ge betz slimicide c-31

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U.S. State Registration Searches

U.S. EPA Product Reg No: 3876-121

Product Registration Status: Active

Approval Date: Jan 23, 1980

Company and Agent Information for Slimicide mc-31

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Manufacturer	Agent	Distributor
Ge betz, inc. 4636 somerton road Trevose, PA 19053 Phone: 2159535588 Company Number: 003876	No Agent, See Company Info.	Betzdearborn (attn: kevin manning) 4636 somerton rd Trevose, PA 19053 2159535588 Company Number: 065720

Distributor Names for Ge betz slimicide c-31

Top

Product names	Distributor	Product Type	Approval Date	Cancellation Date
Ge betz slimicide c-31	Ge betz, inc.	Parent Product	Jan 23, 1980	Active
Slimicide mc-31	Ge betz, inc.	Distributor Product	Oct 29, 1996	Active

Working with the Information on this Page

Click on underlined terms for definitions or go to the Pesticide Tutorial overview page.

Any underlined term with a book icon has additional information.

To print this page, choose **Print**. To export this data, choose **Save As** 'HTML Source' and open it in Excel or equivalent program.

SULFURIC ACID
MATERIAL SAFETY DATA SHEET

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product Identity: Sulfuric Acid (93 percent)

Manufacturer:
Teck Cominco Metals Ltd.
Trail Operations
Trail, British Columbia
V1R 4L8
Emergency Telephone: 250-364-4214

Supplier:
Teck Cominco American Incorporated
Industrial Chemicals
501 North Riverpoint Blvd., Suite 300,
Spokane, WA. 99202

MSDS Preparer:
Teck Cominco Metals Ltd.
600 - 200 Burrard Street
Vancouver, British Columbia
V6C 3L9

Date of Last Review/Edit: December 15, 2006.

Product Use: Used in the manufacture of chlorine dioxide (a pulp and paper bleaching chemical), in the manufacture of phosphate and sulphate fertilizers, in the manufacturing of metal sulfates, as a metal pickling chemical and as a component of lead storage batteries.

SECTION 2. COMPOSITION / INFORMATION ON INGREDIENTS

Hazardous Ingredient	Approximate Percent by Weight	CAS Number	Occupational Exposure Limits (OELs)	LD_{50} / LC_{50} Species and Route
Sulfuric Acid	93%	7664-93-9	OSHA PEL 1 mg/m^3 ACGIH TLV 0.2 mg/m^3 (Thoracic) NIOSH REL 1 mg/m^3	LD_{50} orl-rat 2140 mg/kg LC_{50} ihl-rat 510 mg/m^3/2Hr LC_{50} ihl-rat 375 mg/m^3/4Hr

NOTE: OELs for individual jurisdictions may differ from OSHA PELs. Check with local authorities for the applicable OELs in your jurisdiction. OSHA - Occupational Safety and Health Administration; ACGIH - American Conference of Governmental Industrial Hygienists; NIOSH - National Institute for Occupational Safety and Health. OEL – Occupational Exposure Limit, PEL – Permissible Exposure Limit, TLV – Threshold Limit Value, REL – Recommended Exposure Limit.

Trade Names and Synonyms: Oil of vitriol, electrolyte acid, battery acid, matting acid, H_2SO_4.

SECTION 3. HAZARDS IDENTIFICATION

Emergency Overview: A strong mineral acid present as a colorless and odorless oily liquid when pure but may appear yellow to dark brown when impure. Extremely corrosive to all body tissues, causing rapid tissue destruction and serious chemical burns. Skin or eye contact requires immediate first aid. Can decompose at high temperatures, forming toxic gases such as sulfur oxides. Non-flammable but reacts violently with water, generating large amounts of heat with potential for spattering of the acid. Can react with combustible materials to generate heat and ignition. Reacts with most metals, particularly when diluted with water, to form flammable hydrogen gas which may create an explosion hazard. It is highly toxic to aquatic organisms and plant life.

Potential Health Effects: Sulfuric acid is not very volatile and workplace exposures are therefore primarily due to accidental splashes or to processes or actions that generate an acid mist. It is extremely corrosive to all body tissues, causing rapid tissue destruction and serious chemical burns on contact with the skin or eyes. Skin or eye contact requires immediate first aid. Inhalation of sulfuric acid mist or fumes may produce irritation of the nose, throat and respiratory tract. High levels of acid mist are also irritating to the skin and eyes. Chronic inhalation of acid mist may cause pitting and erosion of tooth enamel. Sulfuric acid, per se, is not listed as a carcinogen by OSHA, NTP, IARC, or the ACGIH. However, IARC, the ACGIH and the NTP have concluded there is sufficient evidence that occupational exposure to strong inorganic acid mists containing sulfuric acid is carcinogenic or potentially carcinogenic to humans. (see Toxicological Information, Section 11)

Potential Ecological Effects: Sulfuric acid is highly toxic to aquatic organisms and plant life but does not bioaccumulate or concentrate in the food chain. (see Ecological Information, Section 12)

SECTION 4. FIRST AID MEASURES

Eye Contact: Avoid direct contact. Wear chemical protective gloves if necessary. Quickly and gently blot excess acid off face. Immediately flush the contaminated eye(s) with lukewarm, gently flowing water, for at least 30 minutes, while holding the eyelid(s) open. If a contact lens is present, DO NOT delay irrigation or attempt to remove the lens. Neutral saline solution may be used as soon as it is available. DO NOT INTERUPT FLUSHING. If necessary, continue flushing during transport to emergency care facility. Take care not to rinse contaminated water into the unaffected eye or onto the face. Quickly transport victim to an emergency care facility.

Skin Contact: Avoid direct contact. Wear chemical protective clothing if necessary. As quickly as possible, remove contaminated clothing, shoes and leather goods (e.g. watchbands, belts) under shower. Flush with lukewarm, gently flowing water for at least 30 minutes. DO NOT INTERUPT FLUSHING. If necessary, and if it can be done safely, continue flushing during transport to emergency care facility. Completely decontaminate clothing, shoes and leather goods before reuse or discard.

Inhalation: Remove source of contamination or move victim from exposure area to fresh air immediately. If breathing has stopped, trained personnel should begin artificial respiration. If the heart has stopped, immediately start cardiopulmonary resuscitation (CPR), or automated external defibrillation (AED). Quickly transport victim to an emergency care facility.

Ingestion: NEVER give anything by mouth if victim is rapidly losing consciousness, or is unconscious or convulsing. Have victim rinse mouth thoroughly with water. DO NOT INDUCE VOMITING. Have victim drink 2 – 8 oz. (60 – 240 ml) of water. If vomiting occurs naturally, have victim lean forward to reduce risk of aspiration. Have victim rinse mouth with water again. Quickly transport victim to an emergency care facility and bring a copy of this MSDS.

SECTION 5. FIRE FIGHTING MEASURES

Fire and Explosion Hazards: Sulfuric acid is not flammable or combustible. However, fires may result from the heat generated by contact of concentrated sulfuric acid with combustible materials. Sulfuric acid reacts with most metals, especially when diluted with water, to produce hydrogen gas which can accumulate to explosive concentrations inside confined spaces. It reacts violently with water and organic materials evolving a considerable amount of heat and is very hazardous when in contact with carbides, cyanides, and sulfides.

Extinguishing Media: Use dry chemical or carbon dioxide extinguishers. Use water spray to cool fire-exposed containers. Use water only if absolutely necessary and DO NOT USE WATER DIRECTLY ON ACID as a violent reaction may occur resulting in spattering of the acid.

Fire Fighting: Fire fighters must be fully trained and wear full protective clothing including an approved, self-contained breathing apparatus which supplies a positive air pressure within a full face-piece mask. For fires close to a spill or where vapors are present, use acid-resistant personal protective equipment.

Flashpoint and Method: Not Applicable.

Upper and Lower Flammable Limit: Not Applicable.

Autoignition Temperature: Not Applicable.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Procedures for Cleanup: Control source of release if possible to do safely. Contain spill, isolate hazard area, and deny entry to unauthorized personnel. Dike area around spill and pump uncontaminated acid back to process if possible. Neutralize spilled material with alkali such as sodium carbonate or sodium bicarbonate, soda ash, lime or limestone granules. If neutralized with lime rock or soda ash, good ventilation is required during neutralization because of the release of carbon dioxide gas. Allow to stand for 1-2 hours to complete neutralization, then absorb any liquid in solid absorbent such as vermiculite or clay absorbents. Place spilled material in suitable labeled containers for final disposal. Treat or dispose of waste spilled material and/or contaminated absorbent material in accordance with all local, regional and national regulations.

Personal Precautions: Acid resistant protective clothing and gloves. Sleeves and pant legs should be worn outside, not tucked into gloves and rubber boots. Use close-fitting safety goggles or a combination of safety goggles and a face shield where splashing is a possibility. Respiratory protection equipment should be worn where exposure to hazardous levels of mist or fume is possible.

Environmental Precautions: This product can pose a threat to the environment. Contamination of soil and water should be prevented. Keep spillage from entering ground, streams or sewers.

SECTION 7. HANDLING AND STORAGE

Store in a dry, cool, well-ventilated area away from incompatible substances. Keep in tightly closed containers which are appropriately labeled. Do not allow contact with water. Do not store near alkaline substances. Always practice good personal hygiene. Refrain from eating, drinking, or smoking in work areas. Thoroughly wash hands before eating, drinking, or smoking**.**

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Protective Clothing: Protective clothing and gloves as well as glasses, goggles or face shield. Appropriate protective clothing should be worn where any possibility exists that skin contact can occur. Use close-fitting safety goggles or a combination of safety goggles and a face shield where any possibility exists that eye contact can occur. An eyewash and quick drench should be provided. Workers should wash immediately when skin becomes contaminated and at the end of each work shift.

Ventilation: Use adequate local or general ventilation to maintain the concentration of sulfuric acid aerosol mists below recommended occupational exposure limits.

Respiratory Protection: Where sulfuric acid mists are generated and cannot be controlled to within acceptable levels, use appropriate NIOSH-approved respiratory protection equipment (a combination of a 42CFR84 Class N, R or P-100 particulate filter and an acid gas cartridge). Note: sulfuric acid mist also causes eye irritation at high concentrations and a full face respirator or supplied air respirator may be necessary in some cases.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Clear, colorless, oily liquid	**Odor:** Odorless when cold	**Physical State:** Liquid	**pH:** Concentration dependant <0.1 (93% Sol'n), 0.3 (5% or 1N Sol'n)
Vapor Pressure: <0.04 kPa (<0.3 mm Hg) @ 25ºC	**Vapor Density:** 3.4 (air = 1)	**Boiling Point/Range:** 280°C	**Freezing/Melting Point/Range:** -35°C
Specific Gravity: 1.84	**Evaporation Rate:** Not Applicable	**Coefficient of Water/Oil Distribution:** No Data Available	**Odor Threshold:** > 1 mg/m³ (Acid mist will irritate the nose and may be sensed as a pungent odor)

Solubility in Water:
Completely soluble with generation of significant heat.

SECTION 10. STABILITY AND REACTIVITY

Stability & Reactivity: Stable under normal temperatures and pressures. Decomposes at 340ºC into sulfur trioxide and water. Extremely reactive with metals, alkalis and many other organic and inorganic chemicals. Hazardous gases such as hydrogen cyanide, hydrogen sulfide and acetylene are evolved on contact with chemicals such as cyanides, sulfides and carbides respectively. Contact with combustible organic matter may cause fire or explosion. Dilution with water generates excessive heat and spattering or boiling may occur. Always add acid to water, NEVER ADD WATER TO ACID.

Incompatibilities: Combustible materials, organic materials, oxidizers, amines, bases, water, excess heat, and metals.

Hazardous Decomposition Products: Sulfur dioxide, sulfur trioxide.

SECTION 11. TOXICOLOGICAL INFORMATION

General: Concentrated sulfuric acid is a direct acting toxicant, producing local effects at the site(s) of contact but no systemic effect. It exerts a strong corrosive action on all tissues due to its severe dehydration action (removing water from tissues). The severity of the chemical burn produced by the concentrated acid is proportional to the strength of the acid and the duration of contact. Burns are deep but typically not severely painful.

Acute:
Skin/Eye: Splashes can cause severe eye burns and may cause irreversible eye injury and possible blindness. Skin contact results in severe burns and may result in permanent scarring. High levels of sulfuric acid mists and aerosols are also irritating to the eyes and skin.

Inhalation: Inhalation may cause severe irritation of the respiratory tract with sore throat, coughing, shortness of breath, laryngeal spasm and delayed lung edema. These symptoms may be aggravated by physical exertion. Asthmatics may be more sensitive to inhaling sulfuric acid mists and asthma may be aggravated by exposure to sulfuric acid.

Ingestion: Ingestion is unlikely in industrial use but will result in severe burns to the mouth, throat, esophagus and stomach which could lead to permanent damage to the digestive tract. Small amounts of acid can also enter the lungs during ingestion or subsequent vomiting and cause serious lung injury.

Chronic: Prolonged exposure to dilute solutions or mists may result in eye irritation (chronic conjunctivitis) and produce skin dermatitis. Exposure to high concentrations of acid mist has caused erosion and discoloration of the anterior teeth. Inhalation of sulfuric acid mist may decrease the ability of the respiratory tract to remove other small particles which may be inhaled. Sulfuric acid, per se, is not listed as a carcinogen by OSHA, the National Toxicology Program (NTP), the International Agency for Research on Cancer (IARC), or the ACGIH. IARC has concluded that there is sufficient evidence that occupational exposure to strong inorganic acid mists containing sulfuric acid is carcinogenic to humans, resulting in an increased incidence of primarily laryngeal cancers. The ACGIH lists strong inorganic acid mists containing sulfuric acid as a suspect human carcinogen (A2) and the NTP have recently re-classified strong inorganic acid mists containing sulfuric acid to a known human carcinogen. OSHA does not list sulfuric acid mist as a carcinogen.

SECTION 12. ECOLOGICAL INFORMATION

Sulfuric acid is very corrosive and is highly toxic to aquatic and terrestrial life even at low concentrations.

SECTION 13. DISPOSAL CONSIDERATIONS

Do not wash down drain or allow to reach natural watercourses. Dispose of neutralized waste consistent with regulatory requirements. If neutralized with lime rock or soda ash, good ventilation is required during neutralization because of the release of carbon dioxide gas.

SECTION 14. TRANSPORT INFORMATION

Proper Shipping Name Transport Canada and U.S. DOT..... Sulfuric Acid
Transport Canada and U.S. DOT Hazard Classification ..... Class 8 Packing Group II (RQ)
U.S. RQ for Sulfuric Acid..... 1,000 lbs.
Transport Canada and U.S. DOT Product Identification Number..... UN1830
Marine Pollutant ..... No
IMO Classification ..... Class 8

SECTION 15. REGULATORY INFORMATION

U.S.
Listed on TSCA Inventory ..... Yes

Hazardous Under Hazard Communication Standard ..... Yes

CERCLA Section 103 Hazardous Substances..... Sulfuric Acid..... Yes ..... RQ: 1000 lbs. (454 kg.)

EPCRA Section 302 Extremely Hazardous Substance..... Yes.....RQ: 1000 lbs. (454 kg.)
Threshold Planning Quantity: 1000 lbs.

EPCRA Section 311/312 Hazard Categories ..... Immediate (Acute) Health Hazard - Corrosive
Immediate (Acute) Health Hazard - Highly Toxic

EPCRA Section 313 Toxic Release Inventory .... Sulfuric Acid ..... CAS NO. 7664-93-9
Percent by Weight: 93%

CANADIAN:
Listed on Domestic Substances List: ..... Yes

WHMIS Classification..... Controlled Product, Classification D1A (Immediate & Serious Toxic Effects), E (Corrosive Material)

SECTION 16. OTHER INFORMATION

The information in this Material Safety Data Sheet is based on the following references:

- American Conference of Governmental Industrial Hygienists, 2004, Documentation of the Threshold Limit Values and Biological Exposure Indices, Seventh Edition.
- American Conference of Governmental Industrial Hygienists, 2005, Guide to Occupational Exposure Values.
- American Conference of Governmental Industrial Hygienists, 2006, Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices.
- Bretherick's Handbook of Reactive Chemical Hazards, 20th Anniversary Edition. (P. G. Urben ed.) 1995.
- Canadian Centre for Occupational Health & Safety CHEMINFO Record No. 122 - Sulfuric Acid, 2005-02-02.
- Commission de la santé et la sécurité du travail, Service du Répertoire toxicologique, Acide Sulfurique, 2006-02-08.
- Industry Canada, Controlled Products Regulations SOR/88-66, as amended.
- International Agency for Research on Cancer (IARC), Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, 1972 – 2006, (multi-volume work), World Health Organization, Geneva.
- International Chemical Safety Cards (WHO/IPCS/ILO), ICSC:0362 – Sulfuric Acid (Revised Oct 2000).
- Merck & Co., Inc., 2001, The Merck Index, An Encyclopedia of Chemicals, Drugs, and Biologicals, Thirteenth Edition.
- National Industrial Chemicals Notification and Assessment Scheme (NICNAS), Sydney, Australia – Existing Chemicals Information Sheet – Sulfuric Acid, 30 June 2003.
- OECD Screening Information Data Base (SIDS) Initial Assessment Report – Sulfuric Acid, January 2001.
- Patty's Toxicology, Fifth Edition, 2001: E. Bingham, B. Cohrssen & C.H. Powell, Ed.
- Sax, N. Irving, 1989, Dangerous Properties of Industrial Materials, Seventh Edition.
- U.S. Department of Health and Human Services, National Institute for Occupational Safety and Health. NIOSH Pocket Guide to Chemical Hazards. CD-ROM Edition September 2005.
- U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, Toxicological Profile for Sulfur Trioxide and Sulfuric Acid, December 1998.
- U.S. Occupational Safety and Health Administration, 1989, Code of Federal Regulations, Title 29, Part 1910.

Notice to Reader

Although reasonable precautions have been taken in the preparation of the data contained herein, it is offered solely for your information, consideration and investigation. Teck Cominco American Incorporated extends no warranty and assumes no responsibility for the accuracy of the content and expressly disclaims all liability for reliance thereon. This material safety data sheet provides guidelines for the safe handling and processing of this product; it does not and cannot advise on all possible situations. Therefore, your specific use of this product should be evaluated to determine if additional precautions are required. Individuals exposed to this product should read and understand this information and be provided pertinent training prior to working with this product.

AMALIE OIL COMPANY

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Compounding
Blending
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MATERIAL SAFETY DATA SHEETS

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

GENERIC NAME: SM,SL, SJ/CF LUBRICATING MOTOR OIL

ISSUE DATE: JULY 2005

THIS MSDS REPRESENTS THE FOLLOWING AMALIE OIL CO. PRODUCTS:
PRO HIGH PERFORMANCE SYNTHETIC BLEND 50, 70, 5w20, 5w30, 10w30, 10w50, 20w50

CAS NUMBER: MIXTURE
SYNONYMS / GENERAL NAMES: MOTOR OIL
24 HOUR EMERGENCY TELEPHONE: (CHEMTREC) 1-800-424-9300
TECHNICAL INFORMATION: 1-800-388-1264

2. COMPOSITION / INFORMATION ON INGREDIENTS / HAZARDOUS INGREDIENTS

COMPONENTS	CAS NO.	%	HAZARD DATA
1) HIGHLY-REFINED SYNTHETIC BASE OILS	MIXTURE	10	ORAL (LD50): >5000 mg/kg
2) HIGHLY REFINED PARAFFINIC PETROLEUM OILS	MIXTURE	75-80 10-25	DERMAL (LD50): >2000 mg/kg
3) PETROLEUM ADDITIVES	MIXTURE	<1	
4) ZINC ALKYLDITHIOPHOSPHATE	68649-42-3		

HAZARDOUS INGREDIENTS: NONE

HAZARDOUS PER 29 CFR 1916.1200: NO

3. HAZARDOUS IDENTIFICATION

ROUTES OF ENTRY:	SKIN CONTACT
TARGET ORGANS:	SKIN
IRRITANCY:	THIS PRODUCT CAN CAUSE MILD, TRANSIENT, EYE IRRITATION WITH SHORT-TERM CONTACT WITH LIQUID OR SPRAYS.
REPRODUCTIVE EFFECTS:	N/A
CANCER INFORMATION:	THIS PRODUCT DOES NOT CONTAIN ANY COMPONENTS AT CONCENTRATIONS ABOVE 0.1% WHICH ARE CONSIDERED CARCINOGENIC BY OSHA, IARC, OR NTP.

4. FIRST AID MEASURES

EYES:	CHECK FOR AND REMOVE CONTACT LENSES. FLUSH EYES WITH COOL, CLEAN, LOW-PRESSURE WATER WHILE OCCASIONALLY LIFTING AND LOWERING EYELIDS. SEEK MEDICAL ATTENTION IF EXCESSIVE TEARING, REDNESS, OR PAIN PERSISTS.
DERMAL:	REMOVE CONTAMINATED SHOES AND CLOTHING. WIPE OFF EXCESS MATERIAL. WASH EXPOSED SKIN WITH SOAP AND WATER. SEEK MEDICAL ATTENTION IF TISSUE APPEARS DAMAGED OR IF IRRITATION PERSISTS. THOROUGHLY CLEAN CONTAMINATED CLOTHING BEFORE REUSE. DISCARD CONTAMINATED LEATHER GOODS.
INGESTION:	DO NOT INDUCE VOMITING UNLESS DIRECTED TO BY A PHYSICIAN. DO NOT GIVE ANYTHING TO DRINK UNLESS DIRECTED TO BY A PHYSICIAN. NEVER GIVE ANYTHING BY MOUTH TO A PERSON WHO IS NOT FULLY CONSCIOUS. SEEK MEDICAL ATTENTION IMMEDIATELY.
INHALATION:	MOVE VICTIM TO FRESH AIR. IF VICTIM IS NOT BREATHING, IMMEDIATELY BEGIN RESCUE BREATHING. IF BREATHING IS DIFFICULT, 100 PERCENT HUMIDIFIED OXYGEN SHOULD BE ADMINISTERED BY A QUALIFIED INDIVIDUAL. SEEK MEDICAL ATTENTION IMMEDIATELY. KEEP THE AFFECTED INDIVIDUAL WARM AND AT REST.
INJECTION:	INJECTION OF PRESSURIZED HYDROCARBONS CAN CAUSE SEVERE, PERMANENT TISSUE DAMAGE. INITIAL SYMPTOMS MAY BE MINOR. INJECTION OF PETROLEUM HYDROCARBONS REQUIRES IMMEDIATE MEDICAL ATTENTION.

5. FIRE FIGHTING MEASURES

FLASH POINT, °C(°F):	216°C(421°F)
FLAMMABLE LIMITS (% BY VOLUME):	**LOWER:** NO DATA **UPPER:** NO DATA
EXTINGUISHING MEDIA:	USE DRY CHEMICAL, FOAM, CARBON DIOXIDE OR WATER FOG.
SPECIAL FIRE FIGHTING PROCEDURES:	N/A
AUTOIGNITION TEMPERATURE:	N/A
EXPLOSION DATA:	N/A
NFPA RATING:	**HEALTH:** 2 **FLAMMABILITY:** 1 **REACTIVITY** 0

6. ACCIDENTAL RELEASE MEASURES

SPILL PROCEDURES: DO NOT TOUCH DAMAGED CONTAINERS OR SPILLED MATERIAL UNLESS WEARING APPROPRIATE PROTECTIVE EQUIPMENT. SLIPPING HAZARD; DO NOT WALK THROUGH SPILLED MATERIAL. STOP LEAK IF YOU CAN DO SO WITHOUT RISK. FOR SMALL SPILLS, ABSORB OR COVER WITH DRY EARTH, SAND, OR OTHER INERT NON-COMBUSTIBLE ABSORBENT MATERIAL AND PLACE INTO WASTE CONTAINERS FOR LATER DISPOSAL. CONTAIN LARGE SPILLS TO MAXIMIZE PRODUCT RECOVERY OR DISPOSAL. PREVENT ENTRY INTO WATERWAYS OR SEWERS. IN URBAN AREA, CLEANUP SPILL AS SOON AS POSSIBLE. IN NATURAL ENVIRONMENTS, SEEK CLEANUP ADVICE FROM SPECIALISTS TO MINIMIZE PHYSICAL HABITAT DAMAGE. THIS MATERIAL WILL FLOAT ON WATER. ABSORBENT PADS AND SIMILAR MATERIALS CAN BE USED. COMPLY WITH ALL LAWS AND REGULATIONS.

7. HANDLING AND STORAGE

HANDLING PROCEDURES: AVOID WATER CONTAMINATION AND EXTREME TEMPERATURES TO MINIMIZE PRODUCT DEGRADATION. EMPTY CONTAINERS MAY CONTAIN PRODUCT RESIDUES THAT CAN IGNITE WITH EXPLOSIVE FORCE. DO NOT PRESSURIZE, CUT, WELD, BRAZE SOLDER, DRILL, GRIND OR EXPOSE CONTAINERS TO FLAMES, SPARKS, HEAT OR OTHER POTENTIAL IGNITION SOURCES. CONSULT APPROPRIATE FEDERAL, STATE AND LOCAL AUTHORITIES BEFORE REUSING, RECONDITIONING, RECLAIMING, RECYCLING OR DISPOSING OF EMPTY CONTAINERS AND/OR WASTE RESIDUES OF THIS PRODUCT.

STORAGE PROCEDURES: KEEP CONTAINER CLOSED. DO NOT STORE WITH STRONG OXIDIZING AGENTS. DO NOT STORE AT TEMPERATURES ABOVE 120°F OR IN DIRECT SUNLIGHT FOR EXTENDED PERIODS OF TIME. CONSULT APPROPRIATE FEDERAL, STATE AND LOCAL AUTHORITIES BEFORE REUSING, RECONDITIONING, RECLAIMING, RECYCLING OR DISPOSING OF EMPTY CONTAINERS OR WASTE RESIDUES OF THIS PRODUCT.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

ENGINEERING CONTROLS:	PROVIDE EXHAUST VENTILATION OR OTHER ENGINEERING CONTROLS TO KEEP THE AIRBORNE CONCENTRATIONS OF MISTS AND/OR VAPORS BELOW THE RECOMMENDED EXPOSURE LIMITS. AN EYE WASH STATION AND SAFETY SHOWER SHOULD BE LOCATED NEAR THE WORK-STATION.
GLOVES PROTECTION:	USE GLOVES CONSTRUCTED OF CHEMICAL RESISTANT MATERIALS SUCH AS NEOPRENE OR HEAVY NITRILE RUBBER IF FREQUENT OR PROLONGED CONTACT IS EXPECTED. USE HEAT PROTECTIVE GLOVES WHEN HANDLING PRODUCT AT ELEVATED TEMPERATURES.
EYE PROTECTION:	SAFETY GLASSES EQUIPPED WITH SIDE SHIELDS SHOULD BE ADEQUATE PROTECTION UNDER MOST CONDITIONS OF USE. WEAR GOGGLES AND/OR FACE SHIELD IF SPLASHING OR SPRAYING IS LIKELY, ESPECIALLY IF MATERIAL IS HEATED ABOVE 125° F (OR 51° C). HAVE SUITABLE EYE WASH WATER AVAILABLE.
RESPIRATORY PROTECTION:	VAPORIZATION OR MISTING IS NOT EXPECTED AT AMBIENT TEMPERATURES. THEREFORE, THE NEED FOR RESPIRATORY PROTECTION IS NOT ANTICIPATED UNDER NORMAL USE CONDITIONS AND WITH ADEQUATE VENTILATION. IF ELEVATED AIRBORNE CONCENTRATIONS ABOVE APPLICABLE WORKPLACE EXPOSURE LEVELS ARE ANTICIPATED, A NIOSH-APPROVED ORGANIC VAPOR RESPIRATOR EQUIPPED WITH A DUST/MIST PREFILTER SHOULD BE USED. PROTECTION FACTORS VARY DEPENDING UPON THE TYPE OF RESPIRATOR USED. RESPIRATORS SHOULD BE USED IN ACCORDANCE WITH OSHA REQUIREMENTS (29 CFR 1910.134).
CLOTHING RECOMMENDATION:	AVOID PROLONGED AND/OR REPEATED SKIN CONTACT, ESPECIALLY AFTER THIS PRODUCT HAS BEEN USED IN A CRANKCASE. IF SPLASHING OR SPRAYING IS EXPECTED, CHEMICAL-RESISTANT (TYVEK®, NITRILE, OR NEOPRENE) PROTECTIVE CLOTHING SHOULD BE WORN. THIS MIGHT INCLUDE LONG-SLEEVES, APRON, SLICKER SUIT, BOOTS, AND ADDITIONAL FACIAL PROTECTION. IF GENERAL CONTACT OCCURS, PROMPLY REMOVE SOAKED CLOTHING AND TAKE A SHOWER.

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE:	LIQUID
ODOR:	MILD PETROLEUM ODOR
pH:	N/A
VAPOR PRESSURE, mm Hg (25 °C):	<0.0001
VAPOR DENSITY:	10+ (AIR =1)
MELTING POINT:	NOT AVAILABLE.
BOILING POINT, 760 mm Hg, °C:	NOT AVAILABLE
SOLUBILITY IN WATER:	INSOLUBLE IN COLD WATER.
SPECIFIC GRAVITY:	0.86 (WATER = 1)
EVAPORATION RATE:	N/A
VISCOSITY 40°C (100°C)	N/A
MOLECULAR WEIGHT:	N/A
PERCENT VOLATILE:	NEGLIGIBLE VOLATILITY

10. STABILITY AND REACTIVITY

STABILITY:	STABLE
INCOMPATIBILITY:	STRONG OXIDIZERS
POLYMERIZATION:	NOT EXPECTED TO OCCUR
THERMAL DECOMPOSITION:	CO_2, CO, SMOKE, FUMES, UNBURNED HYDROCARBONS AND TRACE OXIDES OF SULFUR, NITROGEN, PHOSPHORUS AND ZINC.

11. TOXICOLOGICAL INFORMATION

EYE IRRITATION:	THIS PRODUCT CAN CAUSE MILD, TRANSIENT, EYE IRRITATION WITH SHORT-TERM CONTACT WITH LIQUID OR SPRAYS.
DERMAL IRRITATION:	THIS MATERIAL CAN CAUSE MILD, TRANSIENT SKIN IRRITATION WITH SHORT-TERM EXPOSURE.
INHALATION TOXICITY:	NO SIGNIFICANT ADVERSE HEALTH EFFECTS ARE EXPECTED TO OCCUR UPON SHORT-TERM EXPOSURE TO THIS PRODUCT. ASPIRATION OF LIQUID INTO THE LUNGS CAN CAUSE SEVERE LUNG DAMAGE OR DEATH.
INGESTION IRRITATION:	IF SWALLOWED, NO SIGNIFICANT ADVERSE HEALTH EFFECTS ARE ANTICIPATED. INGESTION CAN CAUSE MILD IRRITATION TO THE DIGESTIVE TRACT OR CAUSE A LAXATIVE EFFECT.
INJECTION SENSITATION:	INJECTION UNDER THE SKIN, IN MUSCLE, OR INTO THE BLOOD STREAM CAN CAUSE IRRITATION, INFLAMMATION, SWELLING, FEVER, AND SYSTEMIC EFFECTS AND MILD CENTRAL NERVOUS SYSTEM DEPRESSION. INJECTION OF PRESSURIZED HYDROCARBONS CAN CAUSE SEVERE, PERMANENT TISSUE DAMAGE. INITIAL SYMPTOMS MAY BE MINOR. INJECTION OF PETROLEUM HYDROCARBONS REQUIRES IMMEDIATE MEDICAL ATTENTION.

CHRONIC EXPOSURE SYMPTOMS	PROLONGED OR REPEATED CONTACT CAN CAUSE MILD SKIN IRRITATION AND INFLAMMATION CHARACTERIZED BY DRYING, CRACKING, (DERMATITIS) OR OIL ACNE.

12. HEALTH INFORMATION

HMIS CODE: **HEALTH:** 2 **FIRE:** 1 **REACTIVITY:** 0

No	**HIGHLY TOXIC**	No	**SENSITIZER**
No	**TOXIC**	No	**REPRODUCTIVE EFFECTS**
No	**CORROSIVE**	No	**MUTAGEN**
No	**IRRITANT**		

13. DISPOSAL CONSIDERATIONS

WASTE DISPOSAL: It is the responsibility of the user to determine if the material is a hazardous waste at the time of disposal. Determine compliance status with all applicable requirements prior to disposal.

NA - NOT APPLICABLE ND - NO DATA NE - NOT ESTABLISHED

14. TRANSPORT INFORMATION

DOT (DEPARTMENT OF TRANSPORTATION)

PROPER SHIPPING NAME:	PETROLEUM LUBRICATING OIL
HAZARD CLASS:	NOT A DOT CONTROLLED MATERIAL (UNITED STATES).
HAZARD IDENTIFICATION NUMBER:	N/A
DOT PLACARD:	N/A
COMPATIBILITY CATEGORY:	N/A

15. REGULATORY INFORMATION

SARA SECTION 313 - TOXIC CHEMICALS:
This product does not contain toxic chemicals under SARA Section 313 and 40 CFR Part 372.

COMPONENTS	CAS #	%

SARA SECTION 311 - HAZARD CATEGORIES:
This product may meet one or more of the criteria for the hazard categories defined in 40 CFR Part 370 as established be Sections 311 and 312 of SARA as indicated below:

NO	**IMMEDIATE (ACUTE) HEALTH HAZARD**	NO	**SUDDEN RELEASE OF PRESSURE HAZARD**
NO	**DELAYED (CHRONIC) HEALTH HAZARD**	NO	**REACTIVE HAZARD**
NO	**FIRE HAZARD**		

SARA SECTION 302 - EXTREMELY HAZARDOUS WASTE:
This product is not known to contain any components in concentrations greater than one percent that are listed as Extremely Hazardous Substances in 40 CFR Part 355 pursuant to the requirements of Section 302(a) of SARA.

CLEAN WATER ACT (CWA):
Under the CWA, discharges of crude oil and petroleum products to surface water without proper Federal and State permits must be reported immediately to the National Response Center at (800) 424-8802.

CERCLA HAZARDOUS SUBSTANCES:
As defined by CERCLA, the term “hazardous substance” does not include petroleum, including crude oil or any fraction thereof which is not otherwise specifically listed or designated as a hazardous substance.

U.S. TSCA INVENTORY
All components of this material are on the U.S. TSCA Inventory or are not required to be listed on the U.S. TSCA Inventory

16. OTHER INFORMATION

THE INFORMATION IN THIS MATERIAL SAFETY DATA SHEET SHOULD BE PROVIDED TO ALL WHO WILL USE, HANDLE, STORE, TRANSPORT, OR OTHERWISE BE EXPOSED TO THIS PRODUCT. THIS INFORMATION HAS BEEN PREPARED FOR THE GUIDANCE OF PLANT ENGINEERING, OPERATIONS AND MANAGEMENT AND FOR PERSONS WORKING WITH OR HANDLING THIS PRODUCT. AMALIE OIL CO. BELIEVES THIS INFORMATION TO BE RELIABLE AND UP TO DATE AS OF THE DATE OF PUBLICATION, BUT MAKES NO WARRANTY THAT IT IS.

NFPA HAZARD RATING	least - 0	slight - 1	moderate - 2	high - 3	extreme - 4
HMIS HEALTH RATING	least - 0	slight - 1	moderate - 2	high - 3	extreme - 4

NA - NOT APPLICABLE ND - NO DATA NE - NOT ESTABLISHED

Thermo SCIENTIFIC
166 Cummings Center
Beverly, MA 01915 USA
Telephone: 978-232-6000
CHEMTREC® 24 hr Emergency: US 800-424-9300; International 703-527-3887

Orion 181811
Oxygen Scavenger Reagent
Material Safety Data Sheet

I. PRODUCT IDENTIFICATION: Oxygen Scavenger Reagent

Part of Orion 181811

PRODUCT USE: Reagent

NFPA RATINGS: HEALTH: 2 FLAMMABILITY: 1 REACTIVITY: 0

II. COMPOSITION/INFORMATION ON INGREDIENTS

		%	LD_{50} mg/kg
COMPONENT	Acetic Acid ($C_2H_4O_2$)		
CAS NO.	64-19-7	60	3,310 (ORL-RAT)
COMPONENT	Iodine (I_2)		
CAS NO.	7553-56-2	20	14,000 (ORL-RAT)
COMPONENT	Deionized Water		
CAS NO.	7732-18-5	20	190,000 (IPR-MUS)

III. HAZARDS IDENTIFICATION

CORROSIVE.
TARGET ORGANS: Respiratory system, eyes, skin, mucous membranes.
ACUTE TOXICITY: Burns of eyes or skin; vapors irritating to eyes, nose, throat, lungs (can cause severe damage). Swallowing may cause severe injury or death.
CHRONIC TOXICITY: Darkened skin, erosion of teeth, irritation as above.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Person with breathing difficulties or sensitive skin may be affected.

IV. FIRST AID MEASURES

EYE AND SKIN CONTACT: Flush with large amounts of water. Contact physician.
INHALATION: Fresh air, artificial respiration if necessary. Get medical attention.
INGESTION: Immediate medical attention. Give large amounts of water, do not induce vomiting.

V. FIRE FIGHTING MEASURES

FLASH POINT: Greater than 200°F AUTOIGNITION POINT:NA
FLAMMABILITY LIMITS: UPPER: NA LOWER: NA
EXTINGUISHING MEDIA: Dry chemical, alcohol foam, or CO_2.

VI. ACCIDENTAL RELEASE MEASURES

Remove all source of ignition, wear protective clothing, ventilate area. Absorb on paper towels, evaporate in hood or set aside for waste disposal.

VII. HANDLING AND STORAGE

Always wear eye protection and gloves when working with this product.

Store at room temperature (material freezes at 62°F). Keep away from heat, strong oxidizers and caustic materials.

VIII. EXPOSURE CONTROLS/ PERSONAL PROTECTION

OSHA & ACGIH THRESHOLD LIMIT: Acetic Acid : 10 ppm TWA; Iodine: 0.1 ppm.
PROTECTIVE EQUIPMENT: Safety glasses, lab coat and gloves.

IX. PHYSICAL AND CHEMICAL PROPERTIES

STATE: Dark red liquid ODOR THRESHOLD: vinegar like odor
SENSITIVITY TO MECHANICAL IMPACT: None
SENSITIVITY TO STATIC DISCHARGE: None
COEFFICIENT OF OIL/WATER DISTRIBUTION: None
SOLUBILITY IN WATER: Soluble pH: < 1.8
SPECIFIC GRAVITY: 1.03
BOILING POINT: 118ºC MELTING POINT: Not determined
VAPOR DENSITY: Not determined

X. STABILITY AND REACTIVITY

Product is stable. Hazardous polymerization will not occur.
Incompatibles: Strong caustics can cause violent spattering. Strong oxidizers (chromic acid, sodium peroxide, nitric acid, etc.) may cause fire or explosion.
Hazardous decomposition product: Carbon monoxide gases may be emitted in a fire.

XI. TOXICOLOGICAL INFORMATION

Route of Exposure: Coughing, tearing, red-irritated skin or eyes.
Teratogen Status: None
Mutagen Status: None
Reproductive Toxicity: None
Carcinogen Status: None

XII. ECOLOGICAL INFORMATION

None available.

XIII. DISPOSAL CONSIDERATIONS

Dispose of in a manner consistent with Federal, State and Local Regulations.

XIV. TRANSPORT INFORMATION

IATA: UN 2790, Class 8 Pkg II.
DOT: UN 2790, Class 8 Pkg II.

XV. REGULATORY INFORMATION

EUROPEAN INFORMATION:

HAZARD SYMBOL: C
RISK PHRASE: R10 Flammable; R35 Causes severe burns.
SAFETY PHRASE: S23 Do not inhale gas/fumes/vapour/spray. S26 In case of contact with eyes rinse immediately with plenty of water and seek medical advice.

US/ CANADA INFORMATION

SARA/Title III: Acetic acid is a CERCLA hazard and is regulated under Section 304 of Title III.
Cal. Proposition 65: Ingredients not listed.
US TSCA Inventory: Ingredients are listed.
CPR Class: E.
TDG Class: 8.
MSDS discloses elements required by the CPR.

XVI. OTHER INFORMATION

THE ABOVE INFORMATION IS BELIEVED TO BE ACCURATE AND REPRESENTS THE BEST INFORMATION CURRENTLY AVAILABLE TO US. ALL PRODUCTS ARE OFFERED IN ACCORDANCE WITH THE MANUFACTURER'S CURRENT PRODUCTION SPECIFICATIONS AND ARE INTENDED SOLELY FOR USE IN ANALYTICAL TESTING. THE MANUFACTURER SHALL IN NO EVENT BE LIABLE FOR ANY INJURY, LOSS OR DAMAGE RESULTING FROM THE HANDLING, USE OR MISUSE OF THESE PRODUCTS.

MSDS prepared by Quality Assurance Group.

Document Number 217202-001 Rev. K Effective Date: December 12, 2007

Thermo SCIENTIFIC
166 Cummings Center
Beverly, MA 01915 États-Unis
Téléphone : 978-232-6000
CHEMTREC® urgence 24 heure: US 800-424-9300; International 703-527-3887

Orion 181811
Réactif désoxygénant
Fiche de données de sécurité

I. IDENTIFICATION DU PRODUIT : réactif désoxygénant

Orion 181811

UTILISATION DU PRODUIT : Réactif

INDICE NFPA : SANTE : 2 INFLAMMABILITE : 1 REACTIVITE : 0

II. COMPOSITION/INFORMATION SUR LES INGREDIENTS

		%	LD_{50} mg/kg
COMPOSANT	Acide acétique ($C_2H_4O_2$)		
N° CAS	64-19-7	60	3.310 (ORL-RAT)
COMPOSANT	Iode (I_2)		
N° CAS	7553-56-2	20	14.000 (ORL-RAT)
COMPOSANT	Eau		
N° CAS	7732-18-5	20	190.000 (IPR-MUS)

III. IDENTIFICATION DES RISQUES

CORROSIF.
ORGANES CIBLES : système respiratoire, yeux, peau, muqueuses.
TOXICITE CHRONIQUE : brûlures des yeux ou de la peau, vapeurs irritantes pour les yeux, le nez, la gorge, les poumons (peut provoquer de graves dommages). L'ingestion peut provoquer des blessures graves voire le décès.
TOXICITE CHRONIQUE : noircissement de la peau, érosion dentaire, irritation comme ci-dessus.
TROUBLES MEDICAUX AGGRAVES PAR EXPOSITION : les personnes ayant des difficultés à respirer ou une peau sensible peuvent être affectées.

IV. MESURES DE PREMIERE URGENCE

CONTACT AVEC LES YEUX ET LA PEAU : rincer à grande eau. Contacter un médecin.
INHALATION : air frais, respiration artificielle si nécessaire. Consulter un médecin.
INGESTION : consulter immédiatement un médecin. Faire boire beaucoup d'eau, ne pas provoquer de vomissement.

V. MESURES DE LUTTE CONTRE L'INCENDIE

POINT D'ECLAIR : supérieur à 200 °F POINT D'AUTO-INFLAMMATION :NA
LIMITES D'INFLAMMABILITE : SUPERIEURE : NA INFERIEURE : NA
AGENTS D'EXTINCTION : agent chimique en poudre, eau, mousse antialcool ou CO_2.

VI. MESURES A PRENDRE EN CAS DE DISPERSION ACCIDENTELLE

Eliminer toute source d'incendie, porter des vêtements de protection, ventiler le local. Absorber avec des serviettes en papier, aspirer dans hotte ou mettre de côté pour l'élimination des déchets.

VII. MANIPULATION ET STOCKAGE

Porter toujours des lunettes et des gants de protection pour travailler avec ce produit.

Entreposer à température ambiante (le matériau gèle à 62 °F). A tenir loin de la chaleur, des oxydants forts et des matières caustiques.

VIII. CONTROLE DE L'EXPOSITION/PROTECTION PERSONNELLE

VALEUR LIMITE DE L'OSHA ET DE L'ACGIH : Acide acétique : 10 ppm Concentration max. admissible ; Iode : 0,1 ppm.
EQUIPEMENTS DE PROTECTION : lunettes, blouse de laboratoire et gants.

IX. PROPRIETES PHYSIQUES ET CHIMIQUES

ETAT: liquide rouge foncé SEUIL OLFACTIF : odeur de vinaigre
SENSIBILITE AU CHOC MECANIQUE : aucune
SENSIBILITE A LA DECHARGE STATIQUE : aucune
COEFFICIENT DE PARTAGE HUILE/EAU : aucun
SOLUBILITE DANS L'EAU : soluble pH : < 1,8
DENSITE : 1,03
POINT D'EBULLITION : 118 ºC POINT DE FUSION : non-réponse
DENSITE DE VAPEUR : non-réponse

X. STABILITE ET REACTIVITE

Le produit est stable. La polymérisation dangereuse ne se produira pas.
Incompatibilité : les matières caustiques fortes peuvent provoquer de violentes éclaboussures. Les oxydants forts (acide chromique, peroxyde de sodium, acide nitrique, etc.) peuvent provoquer des incendies ou des explosions.
Produit de décomposition dangereux : émission possible de monoxyde de carbone lors d'un incendie.

XI. INFORMATIONS TOXICOLOGIQUES

Voie d'exposition : toux, larmes, irritation des yeux ou de la peau.
Risque tératogène : aucun
Risque mutagène : aucun
Toxicité pour la reproduction : aucune
Risque cancérogène : aucun

XII. INFORMATIONS RELATIVES A L'ENVIRONNEMENT

Aucune disponible.

XIII. INFORMATIONS SUR LES POSSIBILITES D'ELIMINATION DES DECHETS

Eliminer selon les procédures et réglementations locales, nationales et communautaires.

XIV. INFORMATIONS RELATIVES AU TRANSPORT

IATA : UN 2790, Classe 8 Groupe d'emballage II.
DOT : UN 2790, Classe 8 Groupe d'emballage II.

XV. INFORMATIONS REGLEMENTAIRES

INFORMATIONS EUROPEENNES :

SYMBOLE DE DANGER : C
PHRASE DE RISQUE : R10 Inflammable ; R35 Provoque de graves brûlures.
PHRASE DE PRECAUTION : S23 Ne pas respirer les gaz/vapeurs/fumées/aérosols. S26 En cas de contact avec les yeux, laver immédiatement et abondamment avec de l'eau et consulter un spécialiste.

INFORMATIONS E.-U./CANADA

Titre III de la loi SARA: l'acide acétique est un risque CERCLA, réglementé selon la Section 304 du Titre III.
Proposition 65 de l'Etat de Californie : ingrédients non répertoriés.
Inventaire US TSCA (loi américaine réglementant les substances toxiques) : ingrédients répertoriés.
Classe RPC : E.
Classe TDG : 8.
Cette FDS contient des informations requises par le RPC.

XVI. AUTRES INFORMATIONS

NOUS CROYONS QUE LES INFORMATIONS CI-DESSUS SONT EXACTES ET REPRESENTENT LES MEILLEURES INFORMATIONS EXISTANTES. TOUS LES PRODUITS SONT OFFERTS CONFORMEMENT AUX SPECIFICATIONS DE PRODUCTION COURANTES DU FABRICANT ET SONT UNIQUEMENT CONCUS POUR DES TESTS D'ANALYSE. LE FABRICANT NE SERA TENU EN AUCUN CAS RESPONSABLE DE TOUTES BLESSURES, PERTES OU DOMMAGES RESULTANT DE LA MANIPULATION, DE L'UTILISATION BONNE OU MAUVAISE DE CES PRODUITS.

FDS préparée par le Groupe Assurance qualité.

Document n° 217202-001 rév. K Date d'entrée en vigueur : le 12 décembre 07

MATERIAL SAFETY DATA SHEET

Product Name: SODIUM HYDROXIDE (CAUSTIC SODA)

Anchor Drilling Fluids USA, Inc.
2431 E 61ST Street, Suite 710, Tulsa, OK 74136

Run Date: 12/22/94 Rev. Date: 05/01/06

I. GENERAL INFORMATION

Chemical Name: SODIUM HYDROXIDE - SOLID CAS#: 1310-73-2

Chemical Family: BASE
Chemical Formula: NaOH
Substance: CAUSTIC SODA ANHYDROUS (ALL GRADES)
Synonyms: SODIUM HYDROXIDE – DRY
NFPA Ratings: Health: 3 Fire: 0 Reactivity: 2
HMIS Ratings: Health: 3 Flammability: 0 Reactivity: 2

Emergency Telephone: CHEMTREC (800) 424-9300 Information Telephone: (918) 583-7701

II. HAZARDOUS INGREDIENTS / IDENTITY INFORMATION

Hazardous Components	TWAPPM	TWA MG/M^3	STEL PPM	STEL MG/M^3	CAS#	OTHER LIMITS	%
1. SODIUM HYDROXIDE		2			1310-73-2		97.0 – 98.2%
2. SODIUM CHLORIDE					7647-14-5		0 – 1.2%
3. SODIUM CARBONATE					497-19-8		0.4 – 1.0%

III. PHYSICAL / CHEMICAL CHARACTERISTICS

Boiling Point °F:	N/A	Color:	WHITE
Specific Gravity:	2.13 @ 20 C	Odor:	ODORLESS
Vapor Pressure:	N/A	Physical State:	SOLID
Percent Volatility:	NOT VOLATILE – 0%	pH:	N/A
Vapor Density:	N/A	Molecular Wt.:	40.00
Evaporation Rate:	N/A	Molecular Formula:	NaOH
Solubility in Water:	COMPLETE – 100%	LC50:	NDA
Melting Point °F:	604 F (318 C)	LD50:	NDA

IV. FIRE & EXPLOSION HAZARD DATA

FIRE & EXPLOSION HAZARDS: Negligible fire hazard.
EXTINGUISHING AGENTS: Do not use water. Use extinguishing agents appropriate for surrounding fire.
FIRE FIGHTING: Move container from fire area if it can be done without risk.
SENSITIVITY to mechanical impact: Not sensitive.
SENSITIVITY to static discharge: Not sensitive.
FLASH POINT °F: Not flammable

V. HEALTH HAZARD DATA

MAJOR HEALTH HAZARDS: MAY CAUSE BURNS TO THE RESPIRATORY TRACT, SKIN, EYES AND GASTROINTESTINAL TRACT. MAY CAUSE PERMANENT EYE DAMAGE.

ROUTES OF ENTRY: Inhalation – YES Skin – YES Ingestion – YES

POTENTIAL HEALTH EFFECTS:

- Inhalation: Short Term Exposure – Irritation (possibly severe), burns, pulmonary edema
  Long Term Exposure – To our knowledge, no effects are known.
- Skin Contact: Short Term Exposure – Irritation (possibly severe), burns
  Long Term Exposure – Dermatitis
- Eye Contact: Short Term Exposure – Irritation (possibly severe), burns, eye damage, blindness
  Long Term Exposure – Visual disturbances
- Ingestion: Short Term Exposure – Irritation (possibly severe), burns, nausea, vomiting
  Long Term Exposure – To our knowledge, no effects are known.

CARCINOGENICITY: NTP – NO IARC Monographs – NO OSHA Regulated

EMERGENCY FIRST AID PROCEDURES:

- Inhalation: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. If respiration or pulse has stopped, have a trained person administer Basic Life Support (Cardio-Pulmonary Resuscitation/Automatic External Defibrillator) and CALL FOR EMERGENCY SERVICES IMMEDIATELY.
- Skin Contact: Immediately flush contaminated areas with water. . Remove contaminated clothing, jewelry, and shoes immediately. Wash contaminated areas with soap and water. Thoroughly clean and dry contaminated GET MEDICAL ATTENTION IMMEDIATELY.
- Eye Contact: Immediately flush eyes with a directed stream of water for at least 15 minutes, forcibly holding eyelids apart to ensure complete irrigation of all eye and lid tissues. Washing eyes within several seconds is essential to achieve maximum effectiveness. GET MEDICAL ATTENTION
- Ingestion: Never give anything by mouth to an unconscious or convulsive person. If swallowed, do not induce vomiting. Give large amounts of water. If vomiting occurs spontaneously, keep airway clear. Give more water when vomiting stops. GET MEDICAL ATTENTION IMMEDIATELY.

NOTE To Physician: The absence of visible signs or symptoms of burns does NOT reliable exclude the presence of actual tissue damage.

VI. ACCIDENTAL RELEASE MEASURES

OCCUPATIONAL RELEASE: Shovel dry material into suitable container. Keep out of water supplies and sewers. This material is alkaline and may raise the pH of surface waters with low buffering capacity. Releases should be reported, if required, to appropriate agencies. Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equal to RQ (U.S. SARA Section 304). If release occurs in the U.S. and is reportable under CERCLA Section 103, notify the National Response Center at (800) 424-8802 (USA) or (202) 426-2675 (USA).

Anchor Drilling Fluids USA, Inc.
2431 E 61ST Street, Suite 710, Tulsa, OK 74136

VII. HANDLING, STORAGE and DISPOSAL

STORAGE:	Store and handle in accordance with all current regulations and standards. Keep container tightly closed and properly labeled. Do not store in aluminum container or use aluminum fittings or transfer lines, as flammable hydrogen gas may be generated. Keep separated from incompatible substances.
HANDLING:	Avoid breathing dust. Do not get in eyes, on skin, or on clothing. Wash thoroughly after handling. When mixing, slowly add to water to minimize heat generation and spattering.
DISPOSAL:	Reuse or reprocess if possible. Dispose of in accordance with all applicable regulations.

VIII. CONTROL MEASURES

EXPOSURE LIMITS:	Sodium Hydroxide: 2 mg/m3 OSHA TWA 2 mg/m3 OSHA ceiling (vacated by 58 FR 35338, June 30, 1993) 2 mg/m3 ACGIH ceiling 2 mg/m3 MEXICO peak
VENTILATION TYPE REQUIRED:	LOCAL EXHAUST – Provide local exhaust ventilation where dust or mist may be generated. Ensure compliance with applicable exposure limits.
PROTECTIVE GLOVES:	Wear suitable gloves. Discard contaminated leather goods. When wet mixing, wear chemical resistant gloves such as butyl rubber, natural rubber, neoprene or nitrile.
EYE PROTECTION:	SAFETY GOGGLES – Wear chemical resistant safety goggles if eye contact is likely. When wet mixing, wear splash resistant safety goggles with a face shield. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.
PROTECTIVE CLOTHING:	Wear protective clothing to minimize skin contact. When potential for contact with wet material exists, wear Tychem ® SL or a similar chemical protective suit. When potential for contact with dry material exists, wear disposable coveralls such as Tyvek ®.
PROTECTIVE MATERIAL TYPES:	Butyl rubber, canvas, leather, natural rubber, neoprene, nitrile, Tychem ®, Tyvek ®
RESPIRATORY PROTECTION:	Wear a NIOSH approved respirator with N95 (dust, fume, mist) filters may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits, or when symptoms have been observed that are indicative of overexposure. A half-face piece air-purifying respirator may be used in concentrations up to 10X the acceptable exposure level and a full-face piece air-purifying respirator may be used in concentrations up to 50X the acceptable exposure level. Supplied air should be used when the level is expected to be above 50X the acceptable level, or when there is a potential for uncontrolled release. A respiratory protection program that meets 29 CFR 1910.134 must be followed whenever workplace conditions warrant use of a respirator.

IX. STABILITY AND REACTIVITY

REACTIVITY:	Stable at normal temperatures and pressure.
CONDITIONS TO AVOID:	Avoid contact with water. Direct contact with water may cause an exothermic reaction. Carbon monoxide gas may form upon contact with reducing sugars, food and beverage products in enclosed spaces.
INCOMPATIBILITIES:	Acids, halogenated compounds, prolonged contact with aluminum, brass, bronze, copper, led, tin, zinc or other alkali sensitive metals or alloys.
HAZARDOUS DECOMPOSITION:	Thermal decomposition products: NONE KNOWN.
POLYMERIZATION:	Will not polymerize.

X. TOXICOLOGICAL INFORMATION

CAUSTIC SODA ANHYDROUS (ALL GRADES):

TOXICITY DATA: Sodium Hydroxide: 1350 mg/kg Dermal-Rabbit LD50. 220 mg/kg (50% solution) Oral-Rat LD50. As a solid, this material interacts with moist tissue to cause damage. When in solution, this material will affect all tissues with which it comes in contact. The severity of the tissue damage is a function of its concentration, the length of tissue contact time, and local tissue conditions. After exposure there may be a time delay before irritation and other effects occur. This material is a strong irritant and is corrosive to the skin, eyes, and mucous membranes. This material may cause severe burns and permanent damage to any tissue with which it comes into contact. Inhalation will cause severe irritation, possible burns with pulmonary edema, which may lead to pneumonitis. Skin contact with this material may cause severe irritation and corrosion of tissue. Eye contact can cause severe irritation, corrosion with possible corneal damage and blindness. In general, chronic effects are due to long-term irritation. This material may cause dermatitis on the skin, or recurrent corneal ulceration and visual disturbances. In rare cases reports have noted long-term inhalation causes bronchial inflammatory reaction or obstructive airway dysfunction.

XI. ECOLOGICAL INFORMATION

ECOTOXICITY DATA:	
FISH TOXICITY:	This material has exhibited moderate toxicity to aquatic organisms.
FATE AND TRANSPORT:	
BIODEGRADATION:	This material is inorganic and not subject to biodegradation
PERSISTENCE:	This material will exist in the disassociated state.
BIOCONCENTRATION:	This material is believed not to bioaccumulate.
OTHER ECOLOGICAL INFO:	This material has exhibited slight toxicity to terrestrial organisms.

Anchor Drilling Fluids USA, Inc.
2431 E 61ST Street, Suite 710, Tulsa, OK 74136

XII. TRANSPORTATION INFORMATION

US DOT 49 CFR 172.101:

US DOT Proper Shipping Name:	"SODIUM HYDROXIDE, SOLID"
US DOT Hazard Class:	8
DOT ID Number:	1823
ID Number:	UN1823
Packing Group:	II
Labeling Requirements:	8
DOT Hazardous Substance(s):	Sodium hydroxide

XIII. REGULATORY INFORMATION

U.S. REGULATIONS:

CERCLA Sections 102a/103 Hazardous Substances (40 CFR 302.4):	Sodium Hydroxide			
SARA TITLE III Section 302 Extremely Hazardous Substances (40 CFR 355.30):	Not regulated			
SARA TITLE III Section 311/312 Hazardous Categories (40 CFR 370.21)	ACUTE:	Yes	CHRONIC:	No
	REACTIVE:	Yes	FIRE:	No
			SUDDEN RELEASE:	No
SARA TITLE III Section 313 (40 CFR 372.65):	Not regulated			
OSHA PROCESS SAFETY (29 CFR 1910.119):	Not regulated			

Solutia Inc.

Material Safety Data Sheet

1. PRODUCT AND COMPANY IDENTIFICATION

Product name: THERMINOL® VP1 Heat transfer fluid

Reference Number: 000000000211 Date: 05/16/2006

Company Information:

United States:
Solutia Inc.
575 Maryville Center Drive, P.O. Box 66760
St. Louis, MO 63166-6760
Emergency telephone: Chemtrec: 1-800-424-9300
International Emergency telephone: Chemtrec: 703-527-3887
Non-Emergency telephone: 1-314-674-6661

Canada:
Solutia Canada Inc.
6800 St. Patrick Street
LaSalle, PQ H8N 2H3
Emergency telephone: CANUTEC: 1-613-996-6666
Non-Emergency telephone: 1-314-674-6661

Mexico:
Solutia MEXICO, S. DE R.L. DE C.V.
Prol. Paseo de la Reforma 2654
Local 501, Piso-5
Col. Lomas Altas
11950 Mexico, D.F.
Emergency telephone: SETIQ: (in Mexico) 01-800-002-1400
Non-Emergency telephone: (in Mexico) 01-55-5259-6800

Brazil:
Solutia Brazil Ltd.
Avenue Carlos Marcondes, 1200
CEP: 12241-420-São José dos Campos/SP-Brazil
Emergency telephone: 55 12 3932 7100 (PABX)
Non-Emergency telephone: 55 11 3365 1800 (PABX)

2. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

Form:	liquid
Colour:	clear to colourless
Odour:	characteristic

WARNING STATEMENTS

WARNING!
Causes eye irritation
Causes skin irritation
Causes respiratory tract irritation
Contains material which can cause liver and nerve damage

POTENTIAL HEALTH EFFECTS

Likely routes of exposure:	eye and skin contact inhalation
Eye contact:	Highly irritating to eyes.
Skin contact:	Highly irritating to skin. Prolonged or repeated skin contact may result in irritant dermatitis.
Inhalation:	Severely irritating if inhaled. No more than slightly toxic if inhaled. Significant adverse health effects are not expected to develop under normal conditions of exposure.
Ingestion:	No more than slightly toxic if swallowed. Significant adverse health effects are not expected to develop if only small amounts (less than a mouthful) are swallowed.
Signs and symptoms of overexposure:	headache fatigue nausea/vomiting indigestion abdominal pain tremors
Target organs/systems:	May cause liver damage May cause nerve damage

Refer to Section 11 for toxicological information.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Components	CAS No.	Average concentration	Concentration range	Units
diphenyl ether	101-84-8	73.5		%
biphenyl	92-52-4	26.5		%

4. FIRST AID MEASURES

If in eyes:	Immediately flush with plenty of water for at least 15 minutes. If easy to do, remove any contact lenses. Get medical attention. Remove material from skin and clothing.
If on skin:	Immediately flush the area with plenty of water. Remove contaminated clothing. Wash skin gently with soap as soon as it is available. Get medical attention. Wash clothing before reuse.
If inhaled:	Remove patient to fresh air. If not breathing, give artificial respiration. If breathing is difficult give oxygen. Remove material from eyes, skin and clothing.

If swallowed: Immediate first aid is not likely to be required.
A physician or Poison Control Center can be contacted for advice.
Wash heavily contaminated clothing before reuse.

5. FIRE FIGHTING MEASURES

Fire point: 127 C

Hazardous products of combustion: carbon monoxide (CO); carbon dioxide; hydrocarbons

Extinguishing media: Water spray, foam, dry chemical, or carbon dioxide

Unusual fire and explosion hazards: None known

Fire fighting equipment: Firefighters, and others exposed, wear self-contained breathing apparatus. Equipment should be thoroughly decontaminated after use.

Miscellaneous advice: This product is not classified as a fire-resistant heat transfer fluid. Precautions to avoid sources of ignitions should be taken.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions: Use personal protection recommended in section 8.

Environmental precautions: Keep out of drains and water courses.

Methods for cleaning up: Contain large spills with dikes and transfer the material to appropriate containers for reclamation or disposal. Absorb remaining material or small spills with an inert material and then place in a chemical waste container. Flush spill area with water.

Refer to Section 13 for disposal information and Sections 14 and 15 for reportable quantity information.

7. HANDLING AND STORAGE

Handling
Avoid contact with eyes, skin and clothing.
Avoid breathing vapour or mist.
Keep container closed.
Use with adequate ventilation.
Wash thoroughly after handling.
Precautions against ignitions and fire should be taken with this product.
Heat transfer fluids are intended for INDIRECT heating purposes ONLY.
This product has not been approved for food grade use.

Emptied containers retain vapour and product residue. Observe all recommended safety precautions until container is cleaned, reconditioned or destroyed. Do not cut, drill, grind or weld on or near this container. The reuse of this material's container for non industrial purposes is prohibited and any reuse must be in consideration of the data provided in this material safety data sheet.

Storage
General: Stable under normal conditions of handling and storage.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Airborne exposure limits: (ml/m3 = ppm)

THERMINOL® VP1	No specific occupational exposure limit has been established.
biphenyl	ACGIH TLV: 0.2 ml/m3 ; mist ; 8-hr TWA OSHA PEL: 0.2 ml/m3 ; 1.0 mg/m3 ; ; 8-hr TWA Mexican OEL: 0.2 ml/m3 ; 1.5 mg/m3 ; ; 8-hr TWA Mexican OEL: 0.6 ml/m3 ; 4 mg/m3 ; ; 15-min STEL
diphenyl ether	ACGIH TLV: 1 ml/m3 ; ; 8-hr TWA ACGIH TLV: 2 ml/m3 ; ; 15-min STEL OSHA PEL: 1 ml/m3 ; 7 mg/m3 ; ; 8-hr TWA Mexican OEL: 1 ml/m3 ; 7 mg/m3 ; ; 8-hr TWA Mexican OEL: 2 ml/m3 ; 14 mg/m3 ; ; 15-min STEL

Eye protection:	Wear safety goggles. Have eye flushing equipment available.
Hand protection:	Wear chemical resistant gloves. Consult the glove/clothing manufacturer to determine the appropriate type glove/clothing for a given application. See Solutia Glove Facts for permeation data.
Body protection:	Wear suitable protective clothing. Consult the glove/clothing manufacturer to determine the appropriate type glove/clothing for a given application. Wear full protective clothing if exposed to splashes. Wash contaminated skin promptly. Launder contaminated clothing and clean protective equipment before reuse. Wash thoroughly after handling. Have safety shower available at locations where skin contact can occur.
Respiratory protection:	Avoid breathing vapour or mist. Use approved respiratory protection equipment (full facepiece recommended) when airborne exposure limits are exceeded. If used, full facepiece replaces the need for face shield and/or chemical goggles. Consult the respirator manufacturer to determine the appropriate type of equipment for a given application. Observe respirator use limitations specified by the manufacturer.
Ventilation:	Provide natural or mechanical ventilation to control exposure levels below airborne exposure limits. If practical, use local mechanical exhaust ventilation at sources of air contamination such as processing equipment.

Components referred to herein may be regulated by specific Canadian provincial legislation. Please refer to exposure limits legislated for the province in which the substance will be used.

9. PHYSICAL AND CHEMICAL PROPERTIES

Flash point:	110 C	Pensky-Martens closed tester
	124 C	Cleveland Open Cup

Autoignition temperature:	612 C	ASTM D-2155
Density:	1.06 g/cm3 @ 25 C	
Boiling point :	257 C	
Crystallising point :	12 C	
Water solubility:	~25 mg/l	

NOTE: These physical data are typical values based on material tested but may vary from sample to sample. Typical values should not be construed as a guaranteed analysis of any specific lot or as specifications for the product.

10. STABILITY AND REACTIVITY

Conditions to avoid:	All sources of ignition.
Materials to avoid:	Contact with strong oxidizing agents.
Hazardous reactions:	Hazardous polymerization does not occur.
Hazardous decomposition products:	None known;

11. TOXICOLOGICAL INFORMATION

This product has been tested for toxicity. Results from Solutia sponsored studies or from the available public literature are described below.

Acute animal toxicity data

Oral:	LD50 , rat, 2,050 mg/kg , No more than slightly toxic
Dermal:	LD50 , rabbit, > 5,010 mg/kg , Practically nontoxic after skin application in animal studies.
Inhalation:	LC50 , rat, 2.66 mg/l , 4 h, Toxic based on animal inhalation exposure studies.
Skin irritation:	rabbit , Slightly irritating to skin., 24 h
Repeat dose toxicity:	rat, , inhalation, 13 weeks, , Produced effects on body weight, serum enzymes and/or organ weights in repeat dose studies.
Repeat dose toxicity:	rat, , gavage, 26 weeks, , Produced effects on body weight, serum enzymes and/or organ weights in repeat dose studies. Effects only observed at very high dose levels.
Target organs affected	kidneys, liver, spleen
Repeat dose toxicity:	rat, , diet, subchronic, , Repeated oral exposure produced liver and kidney changes in animal models.
Target organs affected	liver, kidneys
Developmental toxicity:	rat, gavage, , No effects on offspring observed in laboratory animals in the presence of maternal toxicity.

Mutagenicity: No genetic effects were observed in standard tests using bacterial and animal cells.

Components

Data from Solutia studies and/or the available scientific literature on the components of this material which have been identified as hazardous chemicals under the criteria of the OSHA Hazard Communication Standard (29 CFR 1910.1200) or the Canadian Hazardous Products Act are discussed below.

biphenyl	Chronic exposure has been reported to cause headache, fatigue, nausea, indigestion, abdominal pain, tremor, central and peripheral nerve damage and liver injury. Slightly toxic following oral administration. Practically nontoxic after skin application in animal studies. Practically non irritating to skin (rabbit). Slightly irritating to eyes (rabbit). No mortality or signs of toxicity at the highest level achievable. Irritating to respiratory system in animal models. Produced effects on body weight, serum enzymes and/or organ weights in repeat dose studies. Produced no dermal sensitization (guinea pigs). No effects on offspring observed in laboratory animals in the presence of maternal toxicity. No genetic effects were observed in standard tests using bacterial and animal cells.
diphenyl ether	Predictive patch testing on human volunteers did not produce irritation or sensitization. Slightly toxic following oral administration. Practically nontoxic after skin application in animal studies. Slightly irritating to eyes (rabbit). Slightly irritating to skin (rabbit). Repeated exposure produced respiratory tract irritation in animal models. Repeated exposure produced eye irritation in animal models. No genetic effects were observed in standard tests using bacterial and animal cells.

12. ECOLOGICAL INFORMATION

Environmental Toxicity

Invertebrates	48 h, EC50	Water flea (Daphnia magna)	2.4 mg/l
Fish:	96 h, LC50	Rainbow trout (Oncorhynchus mykiss)	7.6 mg/l
	96 h, LC50	Fathead minnow (Pimephales promelas)	24 mg/l
Algae:	96 h, EC50	Algae (Selenastrum capricornutum)	1.3 mg/l

Biodegradation Modified SCAS (OECD 302A) Primary degradation 99 %

13. DISPOSAL CONSIDERATIONS

US EPA RCRA Status: This material when discarded may be a hazardous waste as that term is defined by the Resource Conservation and Recovery Act (RCRA), 40 CFR 261.24, due to its toxicity characteristic. This material should be analyzed in accordance with Method 1311 for the compound(s) below.

US EPA RCRA D018 Compound/Characteristic: BENZENE

hazardous waste number:

Disposal considerations: Incineration

Miscellaneous advice: This product meets the criteria for a synthetic used oil under the U.S. EPA Standards for the Management of Used Oil (40 CFR 279). Those standards govern recycling and disposal in lieu of 40 CFR 260 -272 of the Federal hazardous waste program in states that have adopted these used oil regulations. Consult your attorney or appropriate regulatory official to be sure these standards have been adopted in your state. Recycle or burn in accordance with the applicable standards.
Solutia operates a used fluid return program for certain fluids under these used oil standards. Contact your Sales Representative for details.
This product should not be dumped, spilled, rinsed or washed into sewers or public waterways.

14. TRANSPORT INFORMATION

The data provided in this section is for information only. Please apply the appropriate regulations to properly classify your shipment for transportation.

US DOT

Proper shipping name:	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. *biphenyl*
Hazard Class:	9
Hazard Identification number:	UN3082
Packing Group:	Packing Group III
Transport label:	Class 9
Special provisions:	This material meets the definition of a marine pollutant.
Other:	Applies ONLY to containers with an RQ or for shipments in bulk via water transportation.

Canadian TDG

Other:	Not regulated for transport.

Reportable Quantity/Limit

US DOT RQ 100 lb *biphenyl*
Package size containing reportable amount: 377 lb

ICAO/IATA Class

Other:	See DOT Information

15. REGULATORY INFORMATION

All components are in compliance with the following inventories: U.S. TSCA, EU EINECS, Canadian DSL, Australian AICS, Korean, Japanese ENCS, Phillipine PICCS, Chinese

Canadian WHMIS classification: D2(A) - Materials Causing Other Toxic Effects
D2(B) - Materials Causing Other Toxic Effects

SARA Hazard Notification:

Hazard Categories Under Title III Rules (40 CFR 370):	Immediate Delayed

Section 302 Extremely Hazardous Substances:	Not applicable
Section 313 Toxic Chemical(s):	biphenyl

CERCLA Reportable Quantity:

100 lbs biphenyl
For this/these chemicals, release of more than the Reportable Quantity to the environment in a 24 hour period requires notification to the National Response Center (800-424-8802 or 202-426-2675).

This product has been classified in accordance with the hazard criteria of the Canadian Controlled Products Regulation and the MSDS contains all the information required by the Canadian Controlled Products Regulation.

Refer to Section 11 for OSHA/HPA Hazardous Chemical(s) and Section 13 for RCRA classification.

Safety data sheet also created in accordance with Brazilian law NBR 14725

16. OTHER INFORMATION

Product use: Heat transferring agents

Reason for revision: Significant changes to the following section(s):, Section 1

	Health	Fire	Reactivity	Additional Information
Suggested NFPA Rating	2	1	0	
Suggested HMIS Rating:	2	1	0	G

Prepared by the Solutia Hazard Communication Group. Please consult Solutia @ 314-674-6661 if further information is needed.

Exhibit 3: US Fish and Wildlife Recommendations – Desert Tortoise Fencing

RECOMMENDED SPECIFICATIONS FOR
DESERT TORTOISE EXCLUSION FENCING
September 2005

These specifications were developed to standardize fence materials and construction procedures to confine tortoises or exclude them from harmful situations, primarily roads and highways. Prior to commencing any field work, all field workers should comply with all stipulations and measures developed by the jurisdictional land manager and the U.S. Fish and Wildlife Service for conducting such activities in desert tortoise habitat, which will include, at a minimum, completing a desert tortoise education program.

FENCE CONSTRUCTION

Materials

Fences should be constructed with durable materials (*i.e.*, 16 gauge or heavier) suitable to resist desert environments, alkaline and acidic soils, wind, and erosion. Fence material should consist of 1-inch horizontal by 2-inch vertical, galvanized welded wire, 36 inches in width. Other materials include: Hog rings, steel T-posts, and smooth or barbed livestock wire. Hog rings should be used to attach the fence material to existing strand fence. Steel T-posts (5 to 6-foot) are used for new fence construction. If fence is constructed within the range of bighorn sheep, 6-foot T-posts should be used (see New Fence Construction below). Standard smooth livestock wire fencing should be used for new fence construction, on which tortoise-proof fencing would be attached.

Retrofitting Existing Livestock Fence

Option 1 (see enclosed drawing). Fence material should be buried a minimum of 12 inches below the ground surface, leaving 22-24 inches above ground. A trench should be dug or a cut made with a blade on heavy equipment to allow 12 inches of fence to be buried below the natural level of the ground. The top end of the tortoise fence should be secured to the livestock wire with hog rings at 12 to 18-inch intervals. Distances between T-posts should not exceed 10 feet, unless the tortoise fence is being attached to an existing right-of-way fence that has larger interspaces between posts. The fence must be perpendicular to the ground surface, or slightly angled away from the road, towards the side encountered by tortoises. After the fence has been installed and secured to the top wire and T-posts, excavated soil will be replaced and compacted to minimize soil erosion.

Option 2 (see enclosed drawing). In situations where burying the fence is not practical because of rocky or undigable substrate, the fence material should be bent at a 90° angle to produce a lower section approximately 14 inches wide which will be placed parallel to, and in direct contact with, the ground surface; the remaining 22-inch wide upper section should be placed vertically against the existing fence, perpendicular to the ground and attached to the existing fence with hog rings at 12 to18-inch intervals. The lower section in contact with the ground should be placed within the enclosure in the direction of potential tortoise encounters and level with the ground surface. Soil and cobble (approximately 2 to 4 inches in diameter; can use larger rocks where soil is shallow) should be placed on top of the lower section of fence material

on the ground covering it with up to 4 inches of material, leaving a minimum of 18 inches of open space between the cobble surface and the top of the tortoise-proof fence. Care should be taken to ensure that the fence material parallel to the ground surface is adequately covered and is flush with the ground surface.

New Fence Construction

Options 1 or 2 should be followed except in areas that require special construction and engineering such as wash-out sections (see below). T-posts should be driven approximately 24 inches below the ground surface spaced approximately 10 feet apart. Livestock wire should be stretched between the T-posts, 18 to 24 inches above the ground to match the top edge of the fence material; desert tortoise-proof fencing should be attached to this wire with hog rings placed at 12 to 18-inch intervals. Smooth (barb-less) livestock wire should be used except where grazing occurs.

If fence is constructed within the range of bighorn sheep, two smooth-strand wires are required at the top of the T-post, approximately 4 inches apart, to make the wire(s) more visible to sheep. A 20 to 24-inch gap must exist between the top of the fence material and the lowest smooth-strand wire at the top of the T-post. The lower of the top two smooth-strand wires must be at least 43 inches above the ground surface.

(72-inch T-posts: 24 inches below ground + 18 inches of tortoise fence above ground + 20 to 24-inch gap to lower top wire + 4 inches to upper top wire = 66 to 70 inches).

INSPECTION OF DESERT TORTOISE BARRIERS

The risk level for a desert tortoise encountering a breach in the fence is greatest in the spring and fall, particularly around the time of precipitation including the period during which precipitation occurs and at least several days afterward. All desert tortoise fences and cattleguards should be inspected on a regular basis sufficient to maintain an effective barrier to tortoise movement. Inspections should be documented in writing and include any observations of entrapped animals; repairs needed including bent T-posts, leaning or non-perpendicular fencing, cuts, breaks, and gaps; cattleguards without escape paths for tortoises or needed maintenance; tortoises and tortoise burrows including carcasses; and recommendations for supplies and equipment needed to complete repairs and maintenance.

All fence and cattleguard inventories should be inspected at least twice per year. However, during the first 2 to 3 years all inspections will be conducted quarterly at a minimum, to identify and document breaches, and problem areas such as wash-outs, vandalism, and cattleguards that fill-in with soil or gravel. GPS coordinates and mileages from existing highway markers should be recorded in order to pinpoint problem locations and build a database of problem locations that may require more frequent checking. Following 2 to 3 years of initial inspection, subsequent inspections should focus on known problem areas which will be inspected more frequently than twice per year. In addition to semi-annual inspections, problem areas prone to wash-outs should

be inspected following precipitation that produces potentially fence-damaging water flow. A database of problem areas will be established whereby checking fences in such areas can be done efficiently.

REPAIR AND MAINTENANCE OF DESERT TORTOISE BARRIERS

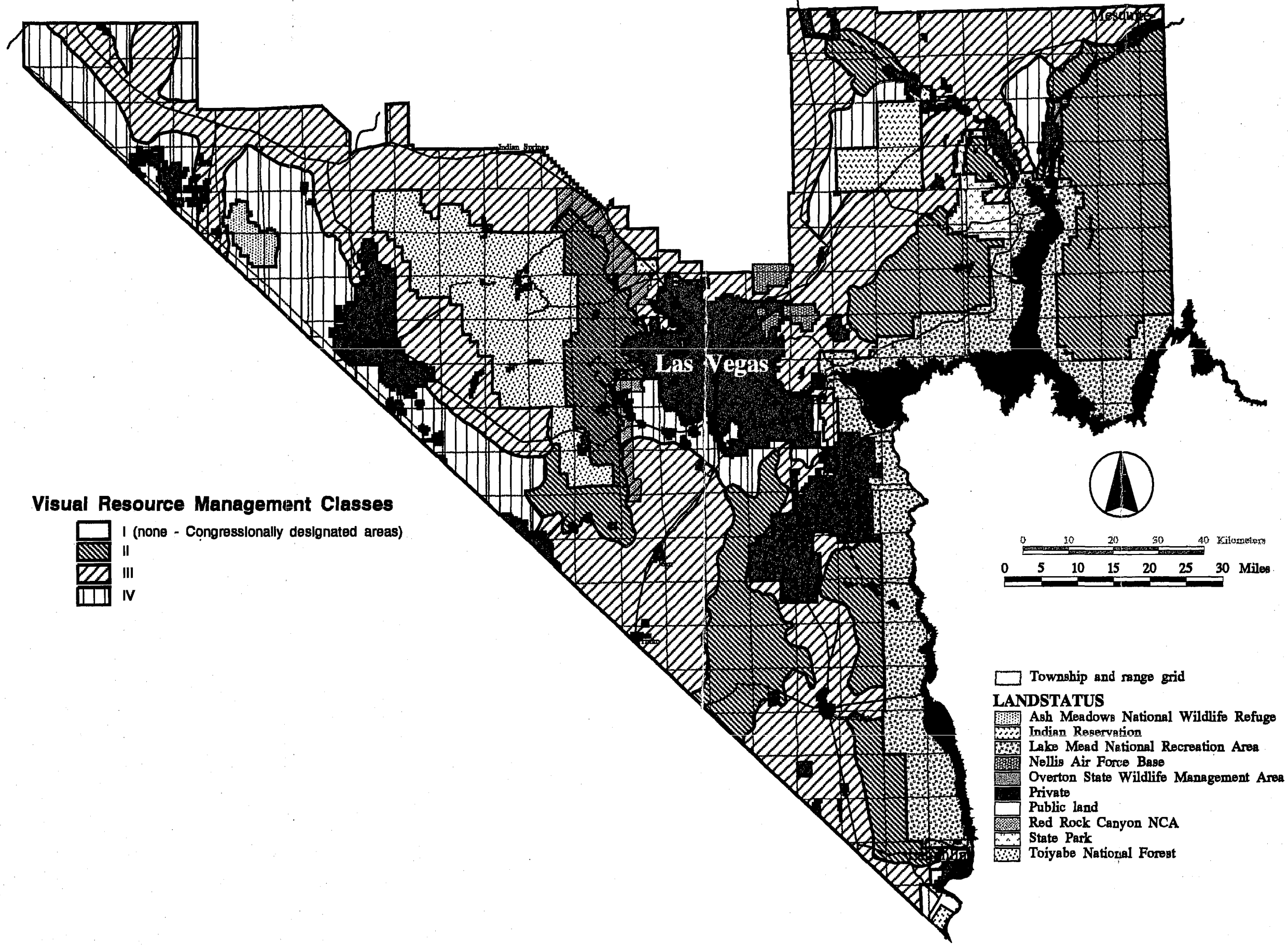
Repairs of fence wash-outs: (1) realign the fence out of the wash if possible to avoid the problem area, or (2) re-construct tortoise-proof fencing using techniques that will ensure that an effective desert tortoise barrier is established that will not require frequent repairs and maintenance.
Gaps and breaks will require either: (a) repairs to the existing fence in place, with similar diameter and composition of original material, (b) replacement of the damaged section to the nearest T-post, with new fence material that original fence standards, (c) burying fence, and/or (d) restoring zero ground clearance by filling in gaps or holes under the fence and replacing cobble over fence constructed under Option 2. Tortoise-proof fencing should be constructed and maintained at cattleguards to ensure that a desert tortoise barrier exists at all times.

All fence damage should be repaired in a timely manner to ensure that tortoises do not travel through damaged sections. Similarly, cattleguards will be cleaned out of deposited material underneath them in a timely manner. In addition to periodic inspections, debris should be removed that accumulates along the fence. All cattleguards that serve as tortoise barriers should be installed and maintained to ensure that any tortoise that falls underneath has a path of escape without crossing the intended barrier.

Exhibit 4: Visual Resources Map

Resource Management Plan

Bureau of Land Management
Las Vegas District



Visual Resource Management Classes

- I (none - Congressionally designated areas)
- II
- III
- IV

0 10 20 30 40 Kilometers

0 5 10 15 20 25 30 Miles

Township and range grid

LANDSTATUS

- Ash Meadows National Wildlife Refuge
- Indian Reservation
- Lake Mead National Recreation Area
- Nellis Air Force Base
- Overton State Wildlife Management Area
- Private
- Public land
- Red Rock Canyon NCA
- State Park
- Toiyabe National Forest

The data contained herein is for informational purposes only. No liability is assumed as to the accuracy of the data or for purposes other than originally intended.

The data was prepared using the BLM's ESRI ARC/INFO geographic information system and maps plotted using the ESRI ArcView system.

Map # 2-9

Prepared July 11, 1997

Exhibit 5: Comparison of wet and dry cooling

1 Cooling Technology Alternatives

As proposed, the Projects' solar power generating equipment will utilize wet cooling technology, using water obtained from the local underground aquifer via an existing well. The dry cooling technology approach is also being considered. The following paragraphs summarize and compare these alternatives.

1.1 Description of Cooling Technologies

Wet Cooling Description. Wet cooling uses circulating water to condense low pressure steam turbine-generator exhaust steam in a shell and tube heat exchanger (condenser). Cool circulating water enters into the tube side of the condenser where it is warmed by the shell-side steam, causing the steam to condense such that condensate pumps may return it to the boiler feed water system. The warm circulating water then travels to a wet mechanical draft cooling tower. The cooling tower dissipates heat through circulating water evaporation and contact with ambient air. Once cooled, the circulating water is returned to the condenser to complete the cooling circuit. The primary mechanism of heat transfer is evaporative cooling inside the cooling tower.

Dry Cooling Description. Dry cooling technology uses an air cooled condenser (ACC) that cools and condenses the low pressure steam turbine-generator exhaust steam using a large array of fans that force air over finned tube heat exchangers arranged in an A frame bundle configuration. The exhaust from the steam turbine flows through a large diameter duct to the ACC where it is condensed inside the tubes running diagonally top to bottom through indirect contact with the ambient air. The heat is then rejected directly to the atmosphere through convection.

1.2 Comparison of Heat Rejection Cooling Alternatives

A comparison of the proposed wet cooling approach to dry cooling is provided below. Differences between wet and dry cooling and a comparison of their advantages and disadvantages for the Projects are discussed.

Comparison of Wet to Dry Cooling Approach. Wet cooling technology has clear performance advantages over dry cooling for the Projects. Performance is enhanced because wet cooling relies primarily upon evaporation to remove heat from the circulating water. Since evaporation occurs relative to the wet bulb temperature (the cooler air temperature at 100 percent humidity vs. dry bulb temperature at actual ambient humidity), wet cooling achieves lower circulating water supply temperatures than dry cooling which is unable to operate below dry bulb temperatures (ambient air temperature). Dry bulb temperatures are generally much higher than wet bulb temperatures

(especially in arid regions such as the High Desert). As the dry bulb temperature increases and humidity decreases, the dry cooling system becomes less efficient as a heat rejection method. This is the reason that wet cooling systems are more efficient than dry cooling systems in areas with low humidity, as is the case at the Project site located in the arid greater Mojave desert area. Also, the decreased efficiency of a dry cooling system at the Project site would be most noticeable in the hot summer months when power demand is highest.

The lower circulating water temperatures of wet cooling systems result in a significant improvement in cycle performance. This is because the lower temperatures result in lower steam turbine generator (STG) backpressure which increases the STG's generation efficiency by lowering the exit enthalpy of the steam, thus maximizing the energy extraction in the turbine itself. Conversely, the requirement to operate at the higher temperatures and higher STG backpressures associated with dry cooling would adversely affect the power output of the facility. It is estimated that the gross power output of the combined-cycle equipment would be between 6-7 percent lower with dry cooling than with wet cooling.

A wet cooling tower would be physically smaller than an ACC because water is more efficient as a heat exchange medium than air. Dry cooling requires much more surface area and very high flow rates of air to remove the same amount of heat as a wet cooling system. An ACC would not need cooling water circulating pumps and circulating piping as would be needed for a wet tower, and also would need a smaller water treatment system (a small wet cooling system would be expected to be needed for cooling other plant equipment even if a dry cooling tower was used for the Project).

Wet cooling operating costs would include the cost of purchasing makeup cooling water (not needed for dry cooling), higher water treatment chemical needs (and associated costs) than dry cooling, and higher power requirements (and costs) for circulating pumps and water treatment activities. However, wet cooling systems require less fan horsepower (and associated costs) than dry cooling. Performance ramifications are estimated and available in a separate document, including operating cost differences considering the net power effects and other items mentioned above (e.g., makeup cooling water purchase).

There are a number of environmental factors that are relevant to the comparison of wet and dry cooling systems for the Projects. An ACC for each of the Projects is estimated to be approximately 120 feet tall and occupy over 40,000 square feet. The proposed wet tower will be 62 feet tall and occupy less than 32,000 square feet. Because it is larger, the dry cooling tower would be more visible and have greater impacts on visual resources. However, the wet cooling tower would occasionally produce a visible plume, which would not be the case for a dry cooling tower. It should be noted that visible plumes would be expected to occur infrequently at the Project site (only in

winter months and primarily during nighttime hours when the plume's visible impacts would be less noticeable), and thus would not represent a significant impact.

A dry cooling system would have less direct emissions than a wet tower because it would not have the drift emissions of a wet tower (emissions of fine entrained droplets that contain dissolved solids that evaporate and form fine particles).

The proposed wet cooling tower can be evacuated and steam seal established quickly for facility start-up. The higher internal volume of a dry cooling tower would increase the evacuation time even with the use of larger vacuum pumps, which could mean a longer start-up time. A longer start-up time would result.

Finally, because a dry cooling system requires larger and more powerful fans than a wet system, an ACC would produce greater noise emissions.

The primary disadvantage of wet cooling (and advantage of an ACC) is water consumption. Since wet cooling relies upon evaporation as the primary mode of heat rejection, water consumption is higher. The cooling tower also requires that a portion of the water be blown down (removed from the system for reuse or disposal) and replaced with fresh water to maintain water chemistry. Because an ACC does not rely upon evaporation for heat transfer, cooling water supply, treatment, and disposal are not issues of concern.

Comparison between Wet Cooling and Air Cooled Options

Air cooled option:

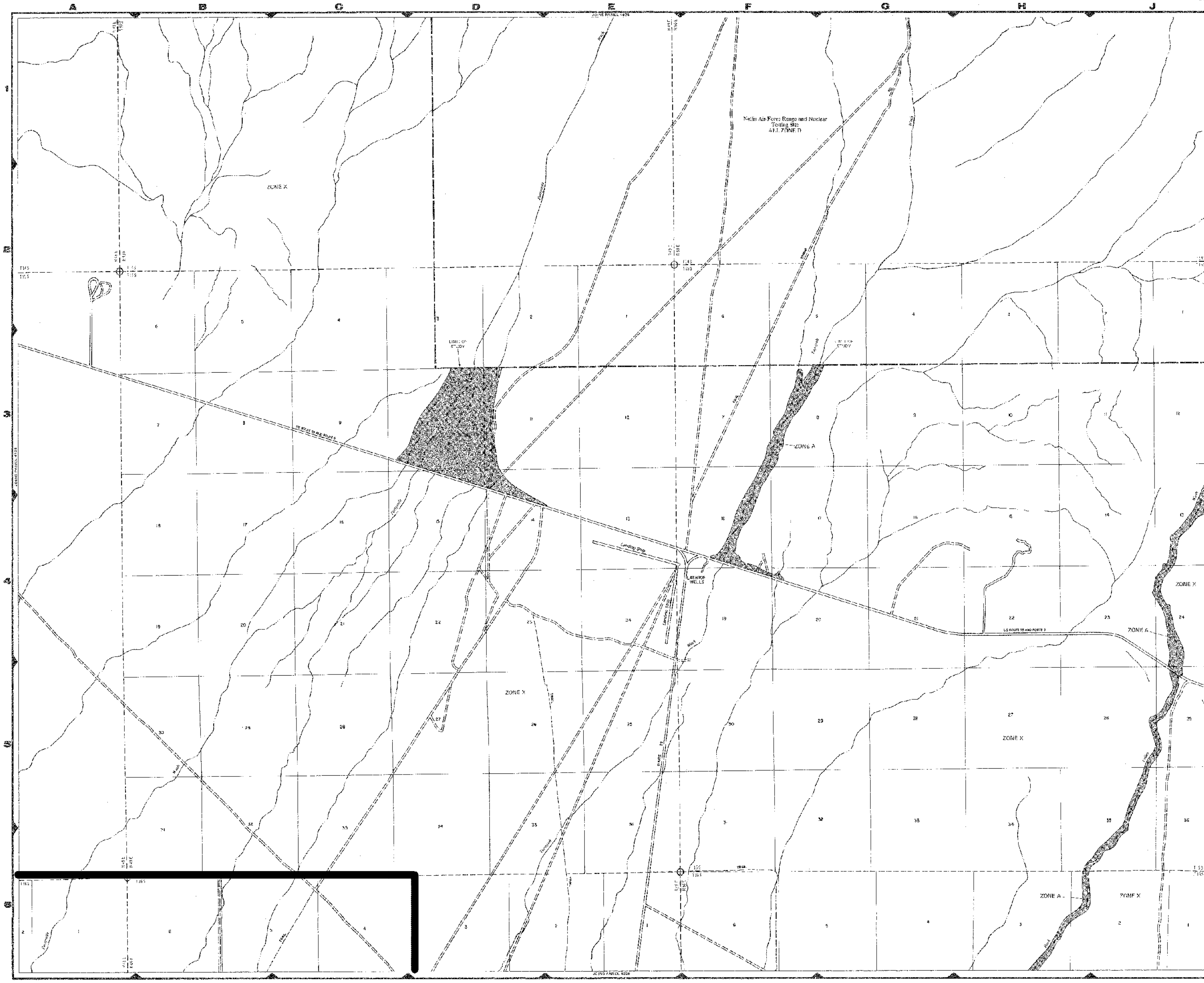
Acreage occupied:	Within the Project power block, an air cooled condenser would occupy an area of approximately 2 acres and have a height of approximately 117 feet.
Plant efficiency:	An air cooled condenser would reduce the plant's efficiency. The lower performance of the air cooled option translates to a less economical plant.
Visual impact:	Condenser tower is larger and taller than a wet cooling tower.
Water treatment sizing:	An air cooled condenser would have insignificant blow-down/evaporation and would significantly reduce the amount of wastewater flow to the evaporation ponds and the amount of water make-up required. However, the air cooled condenser only provides heat rejection for the steam turbine exhaust. There would need to be an additional smaller cooling system (wet or

	dry) added to provide closed cooling water for the balance of plant equipment. This may require a small cooling tower.
Noise:	An air cooled condenser's larger and more powerful fans would generate more noise than the fans on a wet cooling tower.

Wet Cooled Option:

Acreage occupied:	A wet cooling tower would require less than .6 acres and have a height of 62 feet.
Plant efficiency:	This is the most efficient option for energy production.
Visual Impact:	During the winter and predominantly during the nighttime, a wet cooling tower will occasionally produce a plume. The infrequent and nighttime nature of the plume categorizes it as an insignificant visual impact.
Water treatment/sizing	Cooling tower, ponds
Noise:	A wet cooling tower would have the least noise impact on the areas surrounding the plant.

Exhibit 6: FEMA Flood Maps



LEGEND

SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD

- ZONE A
- ZONE AE
- ZONE AH
- ZONE AO
- ZONE A99
- ZONE V
- ZONE VE

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

- ZONE X

OTHER AREAS

- ZONE X — Areas determined to be outside 500-year flood plain.
- ZONE D — Areas in which flood hazards are undetermined.

Flood Boundary

Floodway Boundary

Zone D Boundary

Base Flood Elevation Line; Elevation in Feet*

Cross Section Line

Elevation Reference Mark

*Referenced to the National Geodetic Vertical Datum of 1929

NOTES

APPROXIMATE SCALE IN FEET

2000 0 2000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

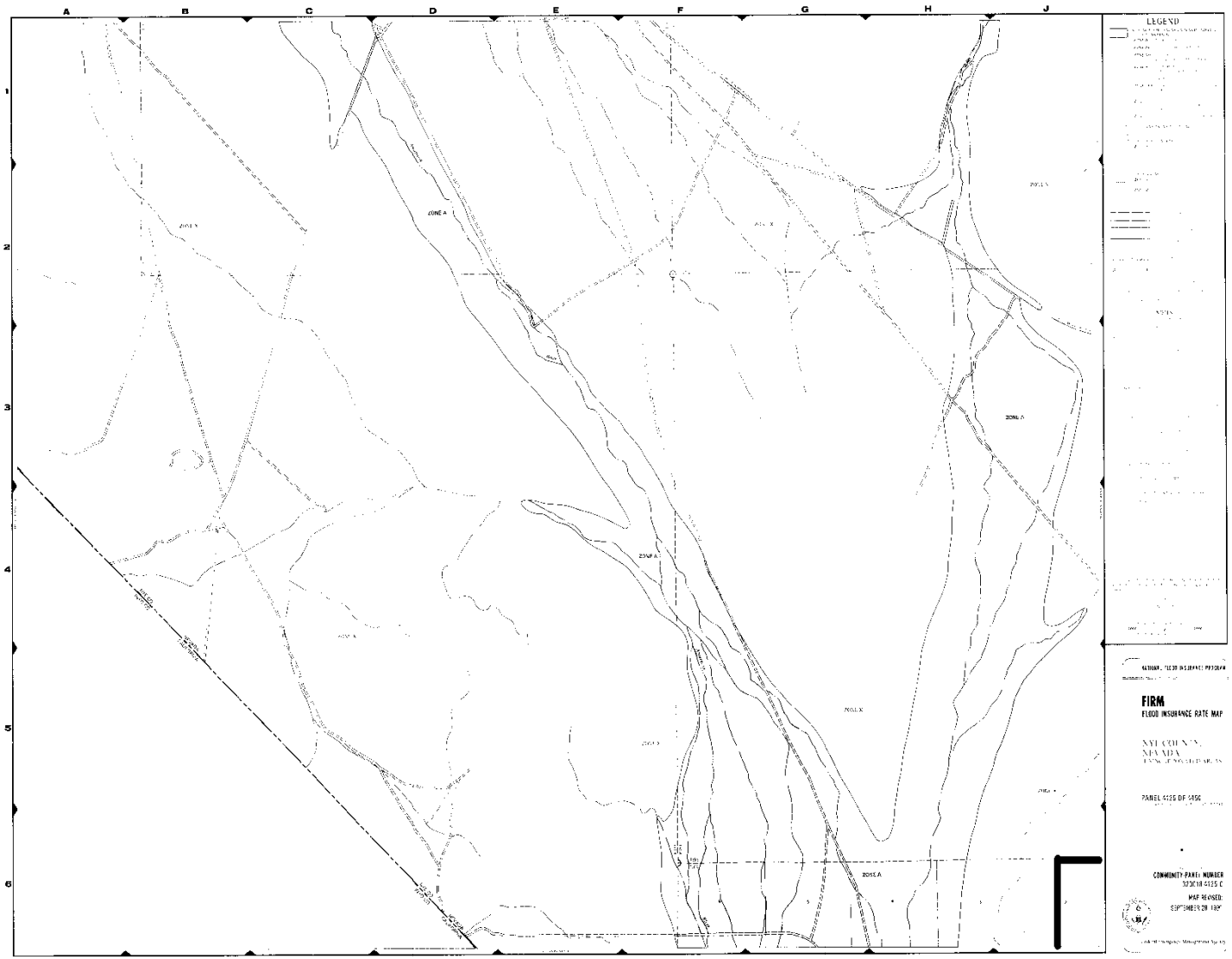
NYE COUNTY,
NEVADA
(UNINCORPORATED AREAS)

PANEL 4150 OF 4450
(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER
320018 4150 C

MAP REVISED:
SEPTEMBER 28, 1990

Federal Emergency Management Agency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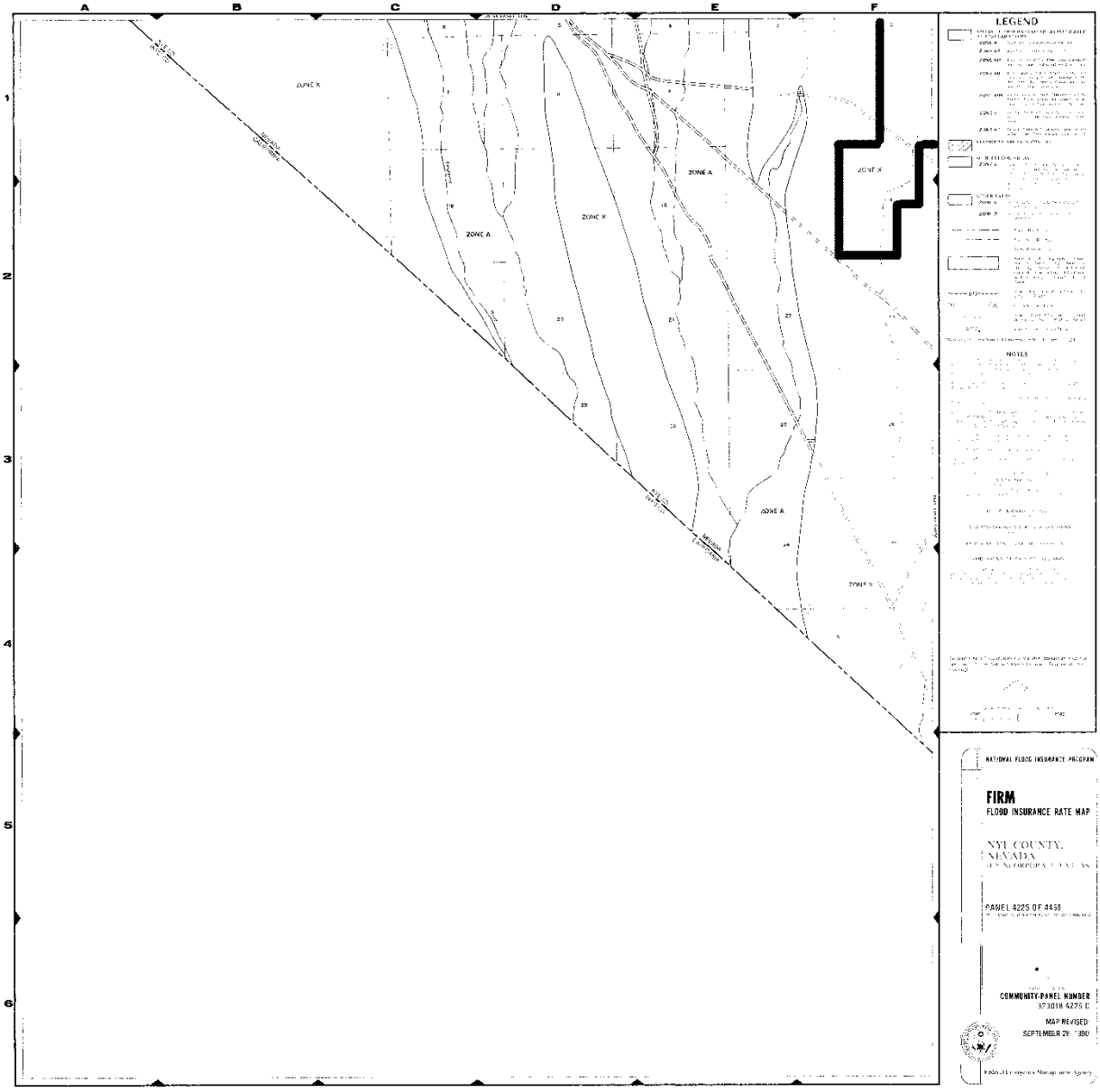
ZONE A
ZONE X
LEGEND
FIRM
FLOOD INSURANCE RATE MAP
PANEL 4135 OF 5850
MAP REVISED: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LEGEND
NOTES
NATIONAL FLOOD INSURANCE PROGRAM
FIRM
FLOOD INSURANCE RATE MAP
NYE COUNTY,
NEVADA
PANEL 4225 OF 4450
COMMUNITY-PANEL NUMBER
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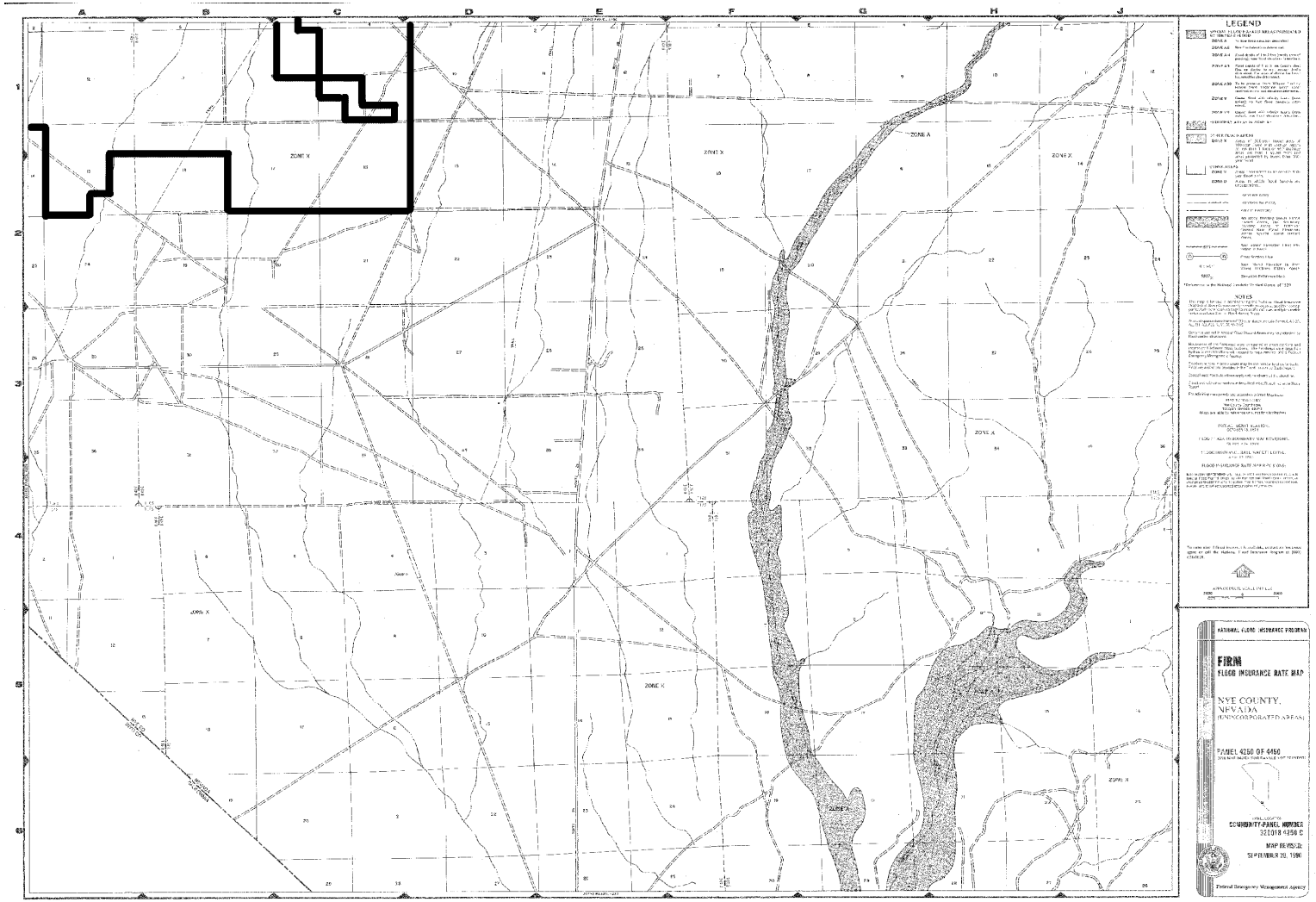
MAP REVISED
SEPTEMBER 29, 1980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ZONE X
ZONE A
LEGEND
NOTES
NATIONAL FLOOD INSURANCE PROGRAM
FIRM
FLOOD INSURANCE RATE MAP
NYE COUNTY, NEVADA
(UNINCORPORATED AREAS)
PANEL 4250 OF 4450
COMMUNITY-PANEL NUMBER
320018 4250 C
MAP REVISED:
SEPTEMBER 29, 1990
Federal Emergency Management Agency